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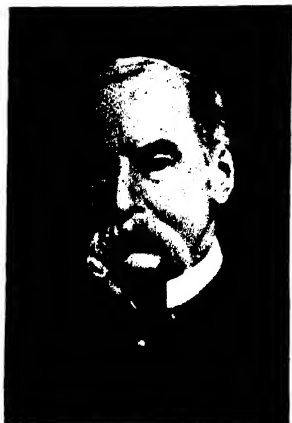


THE NEW  
POPULAR ENCYCLOPEDIA

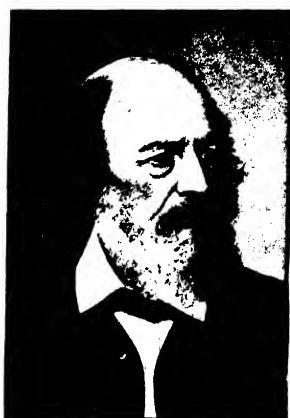




PORTRAITS OF MEN OF THE TIME.—XIV.



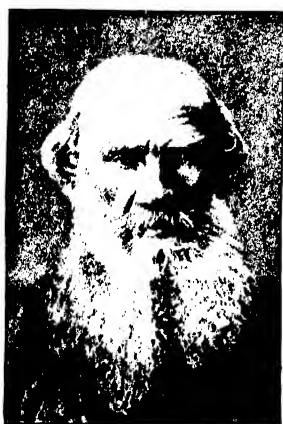
Sir John Tenniel



Lord Tennyson



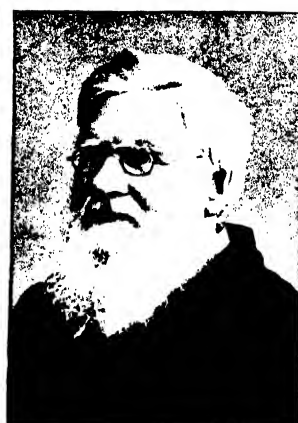
W. M. Thackeray



Count Tolstoi



Prof. R. Y. Tyrrell



A. R. Wallace



Mrs. Humphrey Ward



Lord Wolseley



Emile Zola

\*.\* The portraits are from photographs by Messrs. Elliott & Fry, with the exception of Lord Tennyson (Barrauds, Ltd.), Prof. Tyrrell (Lafayette, Ltd.), Tolstoi, Thackeray, Wallace, and Lord Wolseley (the two latter by the London Stereoscopic Co., Ltd.).





# The New Popular Encyclopedia

A General Dictionary of the  
Arts and Sciences, Literature  
Biography, History, Geography  
&c.

A New and Revised Edition of the Popular Encyclopedia

with

A Supplement in every volume

and

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Issued under the General Editorship of

CHARLES ANNANDALE, M.A., LL.D.

Editor of Ogilvie's "Imperial Dictionary"

Assisted by

MANY SPECIALISTS

IN

THE VARIOUS BRANCHES OF HUMAN KNOWLEDGE

Volume XIV

THE GRESHAM PUBLISHING COMPANY

LONDON AND GLASGOW

1903





## PREFATORY NOTE.

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THE NEW POPULAR ENCYCLOPEDIA is a new edition of a work that first appeared between sixty and seventy years ago, and with necessary successive modifications and improvements has been kept before the public ever since. With the original edition were connected several names of note in their day, and not yet forgotten; specially may be mentioned Allan Cunningham, poet and miscellaneous writer; Sir D. K. Sandford, the distinguished Greek scholar and professor; and Professor Thomas Thomson, M.D., the well-known chemist. To a subsequent edition contributions were made by Lord Kelvin (then Sir William Thomson); James T. Bottomley, D.Sc., F.R.S., his nephew and former deputy; Professor John Perry, D.Sc., LL.D., &c., now of the Royal College of Science, South Kensington; the late Sir Andrew C. Ramsay, director-general of the geological survey of the United Kingdom; the late Professor John Young, M.D., of Glasgow University; Andrew Wilson, Ph.D., Edinburgh, well known as a lecturer and writer; John Ferguson, LL.D., professor of chemistry in Glasgow University; M. M. Pattison Muir, M.A., now fellow and prælector on chemistry of Gonville and Caius College, Cambridge; the late D. K. Clark, railway and mechanical engineer; besides others. A considerable proportion of the matter contributed by those authorities still remains in the Encyclopedia, though lapse of time and the advance of knowledge have often rendered revision and the addition of later information necessary. A full list of contributors to the present edition is given with the final volume. The work has been greatly increased in bulk since it was originally published, and in this respect *The New Popular Encyclopedia* has made a notable advance compared with former editions. Originally articles on living celebrities were not given, the example of the *Encyclopædia Britannica* and other encyclopedias having been followed in this respect; but biographical notices of men of eminence who are still with us are now included, this being a feature that tends to add greatly to the interest and value of any work of the kind. In its original form the work was illustrated chiefly with steel and copper plates, coloured illustrations in an encyclopedia being then unthought of. A few such plates are still given, but the days of steel and copper plates for illustrating popular works are now past; and illustrations of a different kind, and especially a series of plates in colour, have been chosen to accompany the text of many articles in *The New Popular Encyclopedia*. The present editor of the work, it may be added, has had more or less connection with it for over thirty years.

# LIST OF PLATES AND MAPS.

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## SELECT PRONOUNCING LIST OF ENTRIES IN VOL. XIV.

**KEY:** *k* as in fate or in fare, *h* as in far (sometimes short, sometimes long), *a* as in fat, *ɜ* as in fall; *é* as in me, *o* as in met, *ê* as in her; *i* as in pine, *i* as in pin; *ô* as in note, *o* as in not, *ô* as in move; *û* as in tube, *u* as in tub, *u* as in bull, *ü*, the French *u* (sometimes short, sometimes long); *ou* as in pound; *ch* as in chain; *h* as in Scotch loch, German nach; *n* as in French ton; *th* as in thin; *th* as in this; *w* and *y* always consonants; *zh* as in azure or *j* in French jaune.

Tacamahac, tak'a-ma-hak	Tercira, ter-sä-i-rä	Tokyo, tö-kyô'	Tutulla, tu-tu-ë-la
Tacoma, ta-kô-ma	Terebratula, te-re-brat'-u-la	Toledo, tö-lä-dö	Tuyere, tü-ä-rä, tü-ä-rä'
Tahiti, tä-hë-të	Terlizzi, ter-lit-së	Tolentino, tö-len-të-nö	Tycho Brahe, t'ik'o bra'he
Tahitiy, ti-mër	Termini, ter-mi-në	Tollins, tö-lë-nä	Tyrol, ti-ro'
Taine, tä-në	Terpachore, ter-pä-kö-re	Tolosa, tö-lö-sä	
Taiwan, ti-wän'	Terracina, ter-ri-chë-nä	Tolosa, tö-lö-ka	
Talavera, tä-lä-vä-rä	Terre-Haute, tä-r-höt'	Tomato, tö-mä-to, tö-mä-to	U
Talichuana, tä-li-ka-wä-nä	Ternel, tä-ry-ë'	Tongataboo, tung-ga-tä'bo	
Talford, tä'l-fürd	Teachen, täsh'en	Tongres, tung-gr'	
Taliesin, tä-li-ë-sin	Tetanus, tet'a-nus	Tonquin, ton-kün'	Ubeda, ü-be-dä
Tallahassee, tä-la-has'é	Tetuan, tet-u-ä-u'	Tonpilitia, ton-sil-lit-sä	Ucayali, ö-ka-yä-lä
Tallard, tä-lar	Tetoune, tü-to-nëz	Topeka, tö-pë-ka	Udine, ö-dë-në
Talleyrand-Périgord, tä-lä-rän-pä-rë-gör	Tezuco, tes-kö-kö	Torgau, törg'on	Uelerweg, üt-her-väh
Tallien, tä-li-än	Thalberg, tä'l-berk	Tornes, tör-në-s	Ugolino, ö-gö-lë-nö
Tamatave, tä-mä-täv	Thaler, tä'lër	Torquay, tör-kë'	Uhländ, ö'hlant
Tamaulipas, tä-mou-lë-päs	Thales, thä-lëz	Torre del Greco, tor-re-del-grä-kö	Uhlans, ö'lanz
Tamile, tä-méz	Thalia, thä-lia	Torriceili, tor-ri-chel'ë	Uist, ü-ist'
Tampico, täm-pë-kö	Thames, tämz	Tortoise, tört'is	Uitenhage, üt-n-häg
Tanacetum, tä-nä-së-tum	Thann, tä-n	Tortola, tö-tö-lä	Ujiji, ö-jë-jë
Tanamarivö, tä-nä-nä-rë-vö	Theres, thëz	Tortona, tör-tö-nä	Ukase, ö'kas
Tanganika, täng-an-yë-ka	Therne, thë'n	Tortosa, tör-tö-sä	Uleahorg, ö'le-ö-borg
Tangermunde, täng-ër-mün-dë	Thesis, täs	Totara, tö-tä-rä	Ullisla, üt-lis-lä
Tangier, täm-jër	Themistocles, thë-mis-tö-klëz	Toucan, tö-kän	Ulu, ü-lu
Tamhäuser, täm-hoi-zër	Theobald, thë-ö-bald, thä'öld	Toul, töl	Ulm, üt-l'chö
Tantalum, täm-tä-lum	Theodoric, thë-ö-ri-k'it	Toulon-sur-Mer, tö-lön-sür-mär	Ulysses, ö-lis-ës
Tantalus, täm-tä-lus	Theodore, thë-ö-dö-ri-k	Toulouse, tö-löz	Umbilicus, ün-bil'ik-us
Tapiolina, tä-pi-ö-mä	Therapies, thë-rä-pi-ë	Touraine, tö-rän	Umtali, ün-tä-lä
Tapajna, tä-pä-zhö-s	Thermidore, thër-mi-dör	Tournefort, tö-rän-fört	Ungulata, ün-gö-lä-tä
Taprobane, täp-rolä-në	Thermopylae, thër-mop'i-lë	Tourganeil, törg-an-yef	Ungerthal, ö-ni-jen'täl
Tarai, tä-rä'	Thessalonica, thë-sä-lö-ni-ka	Tourmaline, tör-mä-lin	Unterwalden, ün'tër-val-dën
Taranaki, tä-rä-nä-kë	Thiel, tä't	Tours, törs	Unyoro, ün-yö-rö
Tarapacä, tä-ra-pä-ka'	Thiers, tä-är	Toussaint, L'Ouverture, tö-sän lö-ver-tür	Upolu, ö-pö-lö
Tarare, tä-rar'	Thionville, thë-ön-vël	Toxotes, tök'sö-tës	Urbino, ür-bë-nö
Tarazona, tä-rä-thö-nä	Thomas (French), tö-mä	Trachia, trä-kä-a	Uredo, ö-rë-dö
Tarbes, tärb	Thoreau, thö-rö	Trachet, trä-kë	Urethra, ö-rë-thrä
Tardigrada, tä-r-di-grä-dä	Thorn (Russian town), törn	Trache, trä-kë	Urania, ür-ä-nä
Tarifa, tä-rä-fä	Thornwalden, törn-väld-sën	Trapani, trä-pä-në	Uruguay, ö'ry-gwä
Tarn-et-Garonne, tärn-ë-gä-ron	Thou, tö	Trapp, trapp	Urumsyah, ö'rüm-yä
Tarnopol, tä-rn-pöl'	Thourout, tö-rö	Tratena, tröu-te-nou	Usedom, ö'se-döm
Tarnowitz, tä-rn-ö-vits	Thuydon, thuy-sid'ä-dëz	Trebizond, trëb-i-zond'	Ushant, ü-shant'
Tarragona, tä-rä-gö-nä	Thuydon, thuy-sid'ä-dëz	Tredegar, tre-dë-gär	Usurri, ü-sö-rë
Tarrasa, tä-rä-sä	Thun, tön	Trematoda, tre-mä-tö-dä	Usufruct, ö'sü-frukt
Tartarus, tä-rä-rus	Thurgau, thürgön	Treviyan, tre-vë-yän	Uterus, üt'er-nä
Tartufe, tä-rüf	Thuringerwald, thür'ing-ër-väit	Trevelan, tre-vë-län	Utica, üt-i-ka
Tashkent, täsh-kent'	Thyestes, thü-ës-tëz	Trevithick, trëv'i-thik	Utraquists, üt-trä-kuists
Tassandron, tä-s-än-dön'	Thyme, tim	Triest tri-est'	Utrecht, üt-recht
Tassoni, tä-s-ö-në	Tiber, tü-bër	Trikkala, trik'kä-lä	Uttochter, üt-tökt'ä-tër
Tauchnitz, töu-nits	Tibet, thibet, ti-bët'	Tripoli, trip'ö-lë	Uvula, üt-vü-lä
Tauler, töulër	Tic Douliouret, tik dö-lö-rë	Tristan D'Aunha, tris-tän dä-kun'ya	
Taunus, töu-nus	Ticino, ti-chë-nö		V
Tavernier, tä-ver-nä	Tieck, tük		Vaduz, vä'dyts
Tavira, tä-vë-rä	Tiele, t'ë		Vaigatch, vä'gäch
Taygetus, tä-gë-tus	Tiente, tä-en-täin'		Valais, vä-lä
Te Deum Laudamus, tä-dë-um-lä-dä-mus	Tiera-Etat, tä-är-zä-tä		Valdepana, väl-de-pän'yä
Teguer, täng-nä'	Tillemont, tä-lë-mönt		Val de Travers, väl dë-trä-vär
Teguicigalpa, tä-gö-si-gäl'pä	Tillicoutry, tä-li-kö-tri		Valencia, vä-lën-sä
Teguexin, tä-gëks-in	Traboschi, tä-rä-bos-kë		Valencia, vä-lën-thi-lä
Teheran, tä-he-rän'	Tire, tä-rë		Valenciennes, vä-län-yen
Tehuantepec, tä-wän-te-pek'	Triemont, tä-ri-mönt		Valledol, vä-lä-dö-lö'
Teignmouth, täm'thü	Tirnova, tü-rnö-vä		Vallejo, vä-lä-hö
Teinds, täindz	Tiryua, tü-ryü		Valmorbrosa, väl-löm-brö'sä
Tekell, täk-ë-lë	Tischendorf, täsh-ën-dorf		Valon, vä-lön
Telautograph, tä-l'ä-tö-gräf	Titian, Tiziano, tish'i-an, tit-sä-nö		Valparaiso, väl-pä-rä'sö
Telemachus, tä-lëm-a-kus	Titicaca, tit-i-kä-ka		Vambéry, väm-lä-rë
Telesteat, tä-lë-së-tä-i	Tiverton, tü-vër-tün		Vanbrugh, vän-brüh'
Telepeton, tä-lër-pë-ton	Tivoli, tü-vö-lë		Van de Velde, vän dë vel'dë
Tell-el-Kehir, tä-l-ë-ke-bër'	Tobago, tö-bä-gö		Vandyck, vän-dik'
Telugu, tö-lö-gö	Tocantins, tök-an-tinz'		Vanne, vän
Temesvar, tem'es-här	Tocqueville, tök-vël		Vancei, vä-np'ë-sä
Tempe, tem-pë	Todleben, tod-lä-ben		Varinas, vä-rä-näs
Temasserim, tä-näs-së-rim	Toise, tvåz		Vasarhely, vä'sär-häly
Tenulirostrea, ten-ü-i-ros'trëz			Vasari, vä-sä-rë
Terano, tä-rä-mö			

Vauban, vò-báh  
 Vauchuse, vò-klüz  
 Vaud, vò  
 Vail, ve-i  
 Velazquez, ve-lás'keth  
 Velez Malaga, ve-leth mál'a-gá  
 Vellino, ve-lè'nò  
 Velletri, vel-lè'trè  
 Vendée, vahn-dá  
 Vendémiaire, vahn-dá-mi-ár  
 Vendôme, vahn-dòm  
 Venezuela, ve-nes-wá'la  
 Venosa, ve-nò'sá  
 Ventimiglia, ven-ti-mél'yá  
 Venue, ven'ú  
 Vera Cruz, vá'rú króth  
 Verceill, ver-chel'lè  
 Verdun, vár-düh  
 Verechtsagin, ve - resh - chák'gin  
 Vermicelli, ver-mi-chel'lè  
 Verne, vár'n  
 Verne, ver-ná  
 Verona, ve-rò'ná  
 Veronese, vá-rò-ná'zá  
 Versailles, ver-sá'yé, ver-sá'iz  
 Versecz, ver'shets  
 Verviers, ver-vi-á  
 Vesoul, vé-sól  
 Vespucci, ves-pút'ché  
 Veszprim, ves'prim  
 Viareggio, vi-á-red'jó  
 Vland, vi-ò  
 Vienza, vi-chen'táú  
 Vichy, vé-shé  
 Vichua, vi-kón'ya  
 Vienne, vi-án  
 Viersen, fér'zn  
 Vierwaldstättersee, fér'ált-stet-ér-zá  
 Vierzon, vyár-zón  
 Vigny, vén-yé  
 Villach, vil'ák  
 Villa Rica, vil-á rú'kú  
 Villars, vil-lár  
 Villefranche, vil-fránsh  
 Villehardouin, vil-ár-dy-án  
 Villon, vil-lón  
 Vimetro, vi-má'ti-ry  
 Vincennes, vahn-senn  
 Vincí, vin'ché  
 Vindhya, vind'hya  
 Vinet, vé-ná  
 Virchow, fér'h'ò  
 Viscacha, vis-ká'chú  
 Viscount, ví'kóunt  
 Vistula, vis'tú-la  
 Vitobak, vi-topak'  
 Viterbo, vi-ter'bó  
 Vitry-le-François, vé-tré-ló-frán-sí  
 Vizagapatam, vi-zag-a-pá-tam'  
 Vlaardingen, vlar'ding-èn  
 Vladimir, vlá-démér

Vladivostok, vlá-di-vos-tok'  
 Volsci, vol'sí  
 Voralberg, fòr-árl-berh  
 Voages, vòzh  
 Vonsaïra, vòs'wá'rz  
 Vryheid, vrí'híd

## W

Wabash, wá'bash  
 Wadal, wá'dí  
 Wagner, wá'nér  
 Wagram, wá'grám  
 Wahabees, wa-há'béz  
 Walkato, wál-ká'tó  
 Waltzen, vit'sn  
 Wakatipu, wá'ka-ti-pó  
 Walcheren, wál'ke-ren  
 Wallenstein, wál'len-stin  
 Walloons, wa-lónz  
 Walpurga, wál'pur-gá  
 Walsall, wál'sál  
 Walther von der Vogelweide, wál'tér fon der fò'gí-ví'dé  
 Warburton, wár-bér-tun  
 Warburg, wá'r'bú'rt  
 Warthe, wá'r'té  
 Warwick, wó'rik  
 Watteau, wá'tó  
 Wavre, wá'vr  
 Waziristan, wá-zí-rí-stán'  
 Weher, wá'bér  
 Wednesday, wed'nú-be-ri  
 Weert, wé'rt  
 Wei-hai-wei, wei-hí'wei  
 Weimar, ví'már  
 Weinheim, vín'hím  
 Weissenburg, vis'en-bú'rt  
 Weissenfels, vis'en-fels  
 Wellesley, welz'li  
 Wellhausen, vel'hou-zn  
 Welwitschia, wel-wich'i-a  
 Wener, wá'nér  
 Wendau, ver'dou  
 Werden, ver'dén  
 Werff, verf  
 Werner, ver'nér  
 Wernigerode, ver'ni-ge-ró-dé  
 Werra, ver'rá  
 Wesel, wá'zl  
 Weser, wá'zér  
 Weston-super-Mare, wes'tun-sú-pér-má're  
 Wetter, vet'ér  
 Wetterhorn, vet'ér-hörn  
 Wetzlar, vets'lár  
 Wexió, vek'sí-é  
 Whewell, hú'el  
 Wichita, wich'i-ta  
 Widdin, ví'dín  
 Wieland, vé'lánt  
 Wleiczka, vé-lits'ká  
 Wien (Vienna), vén  
 Wiener - Neustadt, vé'nér-nof-stát

Wiesbaden, wés'bá'den  
 Wildbad, vílt'bát  
 Wilhelmshafen, víl'helmz-há-vn  
 Wilhelmshöhe, víl'helmz-hé-e  
 Wilkesbarre, wilks'ba-re  
 Winckelmann, vink'el-mán  
 Winona, wi-nó'na  
 Winterthur, vin'tér-tór  
 Wisby, vis'bí  
 Wiemar, vis'már  
 Witenagemot, wi-te-na-ge-mot'  
 Witten, ví'tn  
 Wittenberg, ví'tn-berh  
 Wittenberge, ví'tn-ber-gé  
 Wolf (proper name), volf  
 Wolfe, wúlf  
 Wolfenbüttel, vol'fén-bút-l  
 Wolftram von Eschenbach, vol'frám fon esh'en-bá'h  
 Wolasey, wúlz'li  
 Woolwich, wú'lich  
 Worcester, wú's'tér  
 Worms (town), wórmz  
 Wouwerman, wou'vér-mán  
 Wrasse, ras  
 Wrexham, reks'am  
 Würtemberg, ví'r'tem-berh  
 Würzburg, wú'rts'bú'rt  
 Würzen, wú'r'tsen  
 Wyandota, wí'an-dot  
 Wycherley, wich'ér-li  
 Wykeham, wí'kám  
 Wyoming, wi-ó'ning

## X

Xavier, zá'vi-ér  
 Xebec, zé-bek'  
 Xenocrates, ze-nok'ra-téz  
 Xenophanes, ze-nof'a-néz  
 Xenophon, zen'o-fon  
 Xeres, he-res'  
 Xerxes, zerk'séz  
 Ximenes, hí-má-nés  
 Xingu, shing-gó'

## Y

Y, Jj, i  
 Yacht, yot  
 Yakutsk, yá-kútsk'  
 Yanina, yán'i-ná  
 Yarkand, yár-kand'  
 Yeadon, yé'don  
 Yenikale, yen-i-ká'lá  
 Yeovil, yó'vil  
 Ymuiden, í'moi-den  
 Yokohama, yó-kó-há'má  
 Yonge, yung

Yoruba, yó'ru-bá  
 Yosemite, yó-sem'i-te  
 Youghal, yál  
 Ypres, é'pr  
 Ypsilanti, íp-sí-lán'tí  
 Yssel, í'ssel  
 Ystad, í'stád  
 Ystradyfodwg, í-strad'í-fod'ug  
 Yttrium, í'trí-um  
 Yucatan, yu-ká-tán'  
 Yuruari, yó-rú-á'ré  
 Yverdon, é-ver-dón  
 Yvetot, év-tó

## Z

Zabern, tsá'bern  
 Zacatecas, tsá-ká-tá'kás  
 Zamora, zam-bá'sé  
 Zante, zán'te  
 Zanzibar, zán-zí-bár'  
 Zedary, zed'o-a-ri  
 Zeijst, zist  
 Zeilah, zí'lá  
 Zeitz, tsits  
 Zemindar, ze-min-dár'  
 Zenana, ze-ná'ná  
 Zeolite, zé'o-lit  
 Zerbst, tsé'pst  
 Zengladon, zú'g'lo-don  
 Zeulenroda, tsó'len-ró-dá  
 Zeus, zús  
 Zeuss, tsóis  
 Zeuxis, zúk'sis  
 Zimmermann, tsim'ér-mán  
 Zinzendorf, tsín'tsen-dorf  
 Zirknitz, tsirk'nits  
 Zittau, tsít'ou  
 Zlatoust, zlá'tóst  
 Znaïm, tsním  
 Zollverein, tsól've-rin  
 Zonaras, zó-ná'ras  
 Zoophyte, zó'o-fit  
 Zoroaster, zor'o-as-tér  
 Zorrilla, thor-rél'ya  
 Zosimus, zó'sí-mus  
 Zouaves, zwávz  
 Zachokke, tsahók'ké  
 Zachopau, tsah'pau  
 Zuccarelli, dzúk-á-rel'lé  
 Zuccaro, dzúk-á-ró  
 Zucchi, dzúk'kó  
 Zug, tsóh  
 Zuider-Zee, zol'dér-zá  
 Zürich, tsú'rit  
 Zutphen, zút'fen  
 Zvornik, tsvor'nik  
 Zweibrücken, tsví'brük-en  
 Zwickau, tsvík'ou  
 Zwingli, tsaving'lé  
 Zwolle, zó'llé  
 Zymotic, zi-mot'ik

# THE NEW POPULAR ENCYCLOPEDIA

## A DICTIONARY OF GENERAL KNOWLEDGE

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**TABULAR-SPAR**, called also **WOLLASTONITE**, a mineral whose primary form is regarded as a monoclinic prism, but which mostly occurs in tabular masses of a grayish-yellow or reddish-brown colour, having a vitreous or pearly lustre. It is a calcium silicate, and is found in granular limestone, volcanic rocks, &c.

**TACAMAHAC**, the name of various oleo-resins allied to elemi, exuded by different species of trees. East Indian tacamahac, yielded by *Calophyllum inophyllum* of Réunion and Madagascar, is a dark-green balsamic resin of specific gravity 1.032, melting at 75° C. A yellow variety is produced by the African tree *Amyris tacamahac*, and another kind comes from the Brazilian *Icica heptaphylla*. The last is also called *conima resin*, and was formerly called *elemi*, and the yellow tacamahac is often called *anime*. Other trees, notably the *Populus balsamifera* of North America, yield similar resins known by the same name.

**TACITUS**, **PUBLIUS CORNELIUS**, a Roman historian, the time and place of whose birth are unknown, but as he was a little older than Pliny the Younger he must have been born not long before 61 A.D., probably about 54. Of his education and early life we know little. He seems to have been first appointed to public office in the reign of Vespasian. He was also treated with distinguished favour by Titus, and was created *quæstor* or *edile*. He himself alludes to this circumstance, but in very general terms, in his works. In the reign of Domitian he became *prætor* (A.D. 88), and as one of the *quindecimviri* college he assisted at the celebration in that year of the *Ludi Sæculares*. In 78 he married the daughter of Cneius Julius Agricola, the celebrated statesman and general, whose life he afterwards wrote. Agricola died at Rome in A.D. 93, at which time Tacitus and his wife were absent, it is not known where. He again returned to Rome after the murder of Domitian, A.D. 96, to live under the mild government of Nerva. The latter rewarded his services with the consulship, A.D. 97. He subsequently seems to have been *proconsul* in Asia. He lived in the closest intimacy with the younger Pliny, and had a very extensive practice in the profession of law, acquiring a high reputation as an orator. The time of his death is uncertain, but it probably took place after A.D. 117. We have four historical works from his pen. His *Annals*, in sixteen books, contain an account of the principal events from the death of Augustus (A.D. 14) to that of Nero (A.D. 68). Books seventh to tenth inclusive, and parts of others, are lost. The first five books were found in the beginning of the sixteenth century in the Abbey of Corvey, Westphalia. His *History* (of which only four books and a part of the fifth are extant) begins with the year 69 A.D., when Galba wore the purple, and ends with

the accession of Vespasian (70), but originally extended to the year 96, and occupied fourteen books. His *Germany* (*De Situ, Moribus et Populis Germaniæ*) and his *Life of Agricola* are his only other historical works. The *Dialogue on the Decline of Eloquence* is by some attributed to him. The works of Tacitus have been pronounced, by the unanimous voice of his contemporaries and of posterity, the master-pieces of a great mind. His style is exceedingly concise, so much so as to make it often difficult to gather his full meaning without great care. He had a wonderful insight into character, and could paint it with a master's hand. A high moral tone pervades all his writings. Among the best editions of his works are those of Gronovius (Amsterdam, 1685, and Utrecht, 1729), Bekker (Leipzig, 1831), Orelli (Zürich, 1846-48), Halm (Leipzig, 1863), and Nipperdey (Berlin, 9th edn., 1892); for English students Furneaux's edition of the *Annals* and Spooner's of the *Histories*. There is a translation of Tacitus in Bohn's Library (two vols.); there is also Church and Brodribb's translation of the *History and Annals* (1873 and 1876).

**TACNA**, the most northerly province of Chili, in South America, bounded south by the province of Tarapaca, east by Bolivia, north by Peru, west by the Pacific Ocean. From the coast inwards the successive stages of the country are marked by the coast range, the guano region, the nitrate region, the foot-hills of the Andes, and the Andes themselves. Silver is mined. Rain is very rare. Tacna is the capital and Arica the chief port. After the war of 1879-81 Peru ceded the provinces of Tacna and Arica to Chili for twelve years, after which time their ownership was to be finally determined by a vote of the inhabitants. This plebiscite has, however, not yet been taken. Pop. in 1895, 24,160. Tacna, the capital, had a population of 9418 in 1895.

**TACOMA**, a rising town of the United States, in the state of Washington, capital of Pierce county, finely situated on a series of terraces rising from the head of Commencement Bay, the south-east arm of Puget Sound. The river Puyallup flows through the town into the bay. Among the chief buildings are the city-hall, court-house, various seminaries and colleges, several churches, an opera-house, &c. There are electric and other tramways. The trade in grain, lumber, coal, tea, and other commodities is large, and the industrial establishments include foundries, smelting-works, railway-works, saw-mills, breweries, flour-mills, &c. The surrounding scenery is very fine. Pop. (1880), 760; (1890), 36,006; in 1901 estimated at 55,000.

**TACTICS** is the branch of military science which relates to the conduct of troops in battle, as opposed to *strategy*, which deals with the movements that lead up to the actual conflict. See **STRATEGY**.

**TADCASTER**, a town of England, in Yorkshire (West Riding), on the river Wharfe, here crossed by a bridge, 13 miles E.N.E. of Leeds. It has a Perpendicular church, reconstructed in 1875-77, several nonconformist chapels, a town-hall, breweries, stone quarries, and a periodical cattle-market. Pop. (1891), 8237; (1901, dist.), 6541.

**TADEMA**. See ALMA-TADEMA in SUPP.

**TADMOR**. See PALMYRA.

**TAEI** a money of account in China, the value of which varies considerably according to locality and the rate of exchange. The tael is a definite weight of silver, equal to 1.23 oz. troy, and accordingly varies in value as silver varies. The sterling value of the Haikwan or customs tael is now about 3s.

**TAEPIINGS**. See CHINA.

**TAFILET**, or **TAFILELT**, an oasis in the southern part of Morocco, some 200 miles south by east of Fez. It covers about 530 square miles, and has a population of about 100,000 distributed amongst about 150 villages, of which Abum is the most important. The date-palm is cultivated, and silks, carpets, and other articles are made to some extent, but the prosperity of the place is mainly due to its thriving trade with the interior of the Soudan. See Harris's *Tafilet* (1895).

**TAGANROG**, a town of Russia, in the government of Ekaterinoslav, on a lofty and rocky tongue of land which projects into the Sea of Azov, opposite the mouth of the Don, 28 miles W.N.W. of Azov. There is a monument to Alexander I., who died here; also churches, exchange, gymnasia, &c. It has manufactures of candles, leather, tobacco, macaroni, &c. The harbour, though the deepest in the Sea of Azov, is shallow, not admitting vessels which draw more than 10 feet; but its situation secures to it a considerable trade. The principal exports are wheat, rye, barley, oats, linseed, rapeseed, wool, oil-cake, caviare, and butter; the imports include fruit, oil, machinery, hides, mineral oil, dry goods, wine, &c. The total value of the exports in 1901 was £5,263,351, and of the imports £687,300. Pop. (1897), 51,748.

**TAGUS** (Spanish, *Tufo*; Portuguese, *Tejo*), the largest river of Spain, issues from the mountains of Albarracin, on the frontier of New Castile and Arragon, a little more than 100 miles from the Mediterranean. Pursuing first a north-westerly and then a south-westerly course, it passes by Aranjuez, Toledo, Talavera, and Alcantara, enters Portugal, and passes by Abrantes, Santarem, and Lisbon, and about 10 miles below Lisbon flows into the Atlantic. Total length, 665 miles. The tide reaches nearly to Santarem, and regular navigation of the river begins at Abrantes. It flows through a mountainous country, and its current is much broken by rocks and cataracts. Its banks are generally rugged, precipitous, and destitute of vegetation, and the plains through which it flows arid and uncultivated. Its principal affluents are the Jamara, Guadarrama, Alberche, Tietar, Alagon, Ponsul, and Zereze on the right bank; and the Guadiela, Almonte, Salor, Sever, and Sorraia on the left.

**TAHITI**, formerly **OTAHEITE**, the largest of the Society Islands, in the southern Pacific Ocean, consisting of two mountainous, volcanic, and roughly circular parts, united by a low, narrow neck of land. The total area is about 400 square miles, and the highest point of the island is 7339 feet above sea-level. The climate is very healthy. The natural vegetation is extremely beautiful and luxuriant, but cultivation is limited to the coastal plain, where also nearly all the population is located. Copra, pearl-shell, cotton, vanilla, and oranges are the chief exports. Papeete, on the north-west coast, is the French

administrative capital and the head-quarters of the French Pacific fleet. The native Tahitians were once a splendid race, and even in spite of civilized degeneration they retain many admirable characters. Their number is rapidly diminishing. Captain Cook visited the island during his memorable voyage of 1769. Pop. (1900), 10,750. See SOCIETY ISLANDS.

**TAIL**. For estates in tail, or entailed estates, see ENTAIL.

**TAILOR-BIRD** (*Orthotomus longicaudus* or *Sutoria sutoria*), a bird belonging to the family of Warblers. The Tailor-bird inhabits India and the Eastern Archipelago, and the genus includes many other species which exhibit a close similarity in structure and habits. They inhabit cultivated districts, and feed chiefly on insects. The nest-building habits are very peculiar, inasmuch as these birds either sew a dead leaf to a living one, or join two neighbouring leaves together, so as to form a kind of hanging pouch, which remains attached to the branch by the leaf-stalk of one or both leaves. The threads which they use consist generally of twisted vegetable fibres, or of actual cotton threads, the bill serving for a needle in puncturing holes in the leaves and in drawing the threads through. Occasionally, if a large enough leaf be found, the nest may be formed by joining together the free edges of the leaf. The lower part of the pouch contains the nest, the upper extremity containing the opening. The nest being usually fixed at the very extremity of a delicate twig or branch is thus protected from the attacks of monkeys, snakes, and other intruders.

**TAIN**, a royal burgh and seaport of Scotland, in the county of Ross and Cromarty, on the south shore of Dornoch Firth, 11 miles W.S.W. of Tarbat Ness. It has handsome modern county buildings, attached to a picturesque old tower (the Bartizan); a parish church, two United Free churches, and a Scotch Episcopal church; an academy; and a public school. There is a good golf-course here. The town contains woollen-factories and distilleries. The old chapel of St. Duthus dates from about 1200. Pop. (1891), 2080; (1901), 2076.

**TAINAN**, a seaport in Formosa, near the south-west coast of the island, having its harbour at Anping.

**TAINÉ**, **HIPPOLYTE ADOLPHE**, a distinguished French critic, philosopher, and historian, was born on April 21, 1828, at Vouziers, in the department of Ardennes. He was educated at the Collège Bourbon, where he gained the rhetoric prize in 1847, and at the École Normale, which he entered in 1848. He had a distinguished college career, but was refused his degree in philosophy because of his unorthodox views. After a period spent in teaching at Nevers, Poitiers, and Besançon, he devoted himself to philosophical studies and became a contributor to the *Revue de L'Instruction Publique*, the *Revue des Deux Mondes*, and the *Journal des Débats*. He took the degree of Doctor of Letters in 1853 with two theses, *De Personis Platonis et Essai sur les Fables de La Fontaine*. The latter attracted much attention, and its subject was further discussed by him in *La Fontaine et ses Fables* (1860). His *Essai sur Tite Live* (1854) was in several respects a most remarkable work, and was crowned by the Academy. A charming account of a journey in the Pyrenees, entitled *Voyage aux Eaux des Pyrénées*, appeared in 1855, and was followed by *Les Philosophes Français au XIX<sup>e</sup> Siècle* (1856), a powerful attack from the stand-point of a kind of Spinozist positivism on the dominant French philosophy of the time. His literary masterpiece, *Histoire de la Littérature Anglaise* (translated into English by Van Laun, four vols.), was published in 1864. It is a

brilliant and able work, in which the literature of England is treated in the spirit of a naturalist. The individual writers and the literary development of the nation as a whole are regarded from the fatalistic stand-point of a firm believer in the application of physiological and mechanical methods to intellectual and spiritual affairs. In the year of the publication of this work he was appointed professor of aesthetics at the *École des Beaux-Arts*. His principal contribution to philosophy is *De L'Intelligence* (two vols., 1870), and his chief historical work is an elaborate treatise entitled *Les Origines de la France Contemporaine*, which was suggested by the disasters of 1870-71. The first volume, *L'Ancien Régime*, appeared in 1875; three volumes on *La Révolution* (1878-84) followed, entitled respectively *L'Anarchie*, *La Conquête Jacobine*, and *Les Gouvernements Révolutionnaires*; and the whole was completed by two volumes on *Le Régime Moderne* (1890-94). The views expressed in this work are acceptable to none of the partisan sections in France, because the Bourbon régime, the revolution and its chief leaders, and Napoleon are all alike subjected to severe criticism. Taine's other published works are the following:—*Essais de Critique et d'Histoire* (1857); *Écrivains Actuels de L'Angleterre* (1863); *Idealisme Anglais* (1864), a study of Carlyle; *Positivisme Anglais* (1864), a study of John Stuart Mill; *Nouveaux Essais de Critique et d'Histoire* (1865); *Philosophie de L'Art* (1865); *Philosophie de L'Art en Italie* (1866); *Voyage en Italie* (1866); *Notes sur Paris, ou Vie et Opinions de M. Frédéric-Thomas Grandorge* (1867); *L'Ideal dans L'Art* (1867), lectures delivered at the *École des Beaux-Arts*; *Philosophie de L'Art dans les Pays-Bas* (1868); *Philosophie de L'Art en Grèce* (1870); *Du Suffrage Universel* (1871); *Notes sur L'Angleterre* (1871), a work of considerable value; *Derniers Essais de Critique et d'Histoire* (1894); and *Carnets de Voyage: Notes sur la Province* (1897). M. Taine was created honorary D.C.L. of Oxford in 1871, and in 1878 he was elected a member of the French Academy. He died at Paris on March 5, 1893.

TAIT, ARCHIBALD CAMPBELL, Archbishop of Canterbury, was born in Edinburgh on Dec. 21, 1811. He was brought up a Presbyterian, and received his education in the high-school and the academy of his native city. He entered the University of Glasgow in 1827, and having gained a Snell exhibition he matriculated at Balliol College, Oxford, in 1830, becoming about the same time a member of the Church of England. He graduated B.A. with a first in classics in 1833, and was elected a fellow of his college in the following year. He was ordained in 1836, and was a tutor of Balliol for seven years. Several of his intimate friends were carried away by the Tractarian movement, but he himself was wholly untouched by it. He joined in a public protest against the celebrated Tract XC. He succeeded Dr. Arnold in the headmastership of Rugby school in 1842, and retained this post till 1850, when he was appointed Dean of Carlisle. He took an active part in the work of university reform at Oxford, and in 1856 he was appointed to the see of London. He declined the archbishopric of York in 1862, and in 1869 he was appointed Archbishop of Canterbury. He at first opposed the bill for the disestablishment of the Irish Church, but on being appealed to by the queen he accepted the inevitable, and induced the House of Lords to pass it. He was also instrumental in securing the enactment of the Public Worship Regulation Act of 1874. His mind was of a tolerant and statesmanlike cast, and he acted with dignity in the critical events of his time, such as the *Essays* and *Reviews* controversy and the

Colenso case. He died at Addington on Dec. 1, 1882. See the biography by Davidson and Benham (two vols. 1891).

TAIT, PETER GUTHRIE, physicist, was born at Dalkeith on April 28, 1831. He was educated at Edinburgh Academy and University, afterwards proceeding to St. Peter's College, Cambridge, where he graduated as senior wrangler and first Smith's prizeman. Elected fellow of Peterhouse in 1852, he became professor of mathematics at Queen's College, Belfast, two years later, and held that office till his appointment in 1860 to the chair of natural philosophy in the University of Edinburgh. He died on July 4, 1901. His published works include, besides many papers read before learned societies, *Dynamics of a Particle* (1856), with Mr. Steele; *Quaternions* (1867); *Thermo-Dynamics* (1868); *Recent Advances in Physical Science* (1876); *Heat* (1884); *Light* (1884); *Properties of Matter* (1885); *Dynamics* (1895); *Newton's Laws of Motion* (1899); &c. He was joint-author with Lord Kelvin (which see in SUPP.) of a well-known Treatise on Natural Philosophy; and he also collaborated with the late Balfour Stewart (which see in SUPP.) in a work on *The Unseen Universe*. A collection of his scientific papers was published in 1898. He was secretary of the Royal Society of Edinburgh.

TAIWAN. See FORMOSA.

TALAVERA DE LA REINA (Latin, *Talabriga*), a town in Spain, New Castile, in the province of Toledo, on the Tago, 64 miles south-east of Madrid. The town, which was formerly fortified, is now much decayed. It has some interesting churches, but perhaps the principal object of interest is a fine bridge, 1500 feet in length. Its present manufactures include earthenware, soap, &c. A severe battle was fought here July 28 and 29, 1809, between the French under Victor, Jourdan, and King Joseph, and the British under Wellington, in which the former were defeated. Pop. 12,000.

TALBOT, a breed of dog formerly well known in England, and regarded by some as an ancestor of the blood-hound.

TALBOT, WILLIAM HENRY FOX, a leading name in the history of photography, was born near Chippenham on Feb. 11, 1800, and educated at Harrow and Trinity College, Cambridge. He graduated B.A. in 1821, and proceeded M.A. in 1825. His attention was directed to the chemical action of light in 1826, and in 1839 his invention of photogenic drawing was explained by Faraday at the Royal Institution and by himself in a paper communicated to the Royal Society. He patented his calotype process in 1841, and at various later dates took out further patents in connection with photography. For his place in the history of photography see the article on that subject. Talbot was also an able mathematician, and he was one of the early decipherers of cuneiform inscriptions. He was awarded the Royal Society's Royal medal in 1838, and its Rumford medal in 1842. He was member of Parliament for Chippenham in 1833-34, and he died on Sept. 17, 1877. His works include: *Legendary Tales* (1830); *Hermes, or Classical Antiquarian Researches* (1838-39); *The Antiquity of the Book of Genesis* (1839); *English Etymologies* (1847); and *Assyrian Texts Translated* (1856).

TALBOTYPE. See PHOTOGRAPHY.

TALC, native hydrated silicate of magnesium, a well-known and widely-diffused species of mineral. It is rarely seen under a distinctly crystalline form. Its primary form is believed to be a right rhombic prism of 120° and 60°. It is sometimes seen in minute hexagonal plates, and in a figure resembling the frusta of two cones applied base to base. Cleav-



age highly perfect; fracture not observable; lustre pearly upon the faces of crystallization and of cleavage; colour various shades of green, as blackish-green, leek-green, celandine-green, and apple-green; streak similar to the colour; semi-transparent to translucent. It exhibits different colours, sometimes in different directions; sectile in a high degree: thin laminae are easily flexible. It is one of the softest of all solid minerals. The massive kinds present a great variety of structure. The composition varies from imperfect columnar to granular and impalpable. The species talc has been subdivided into a great number of varieties or sub-species, the most of which depend upon colours, composition, and foreign admixtures. The varieties of dark-green (leek-green and celandine-green) colours, inclining to brown, constitute *chlorite*, which has been subdivided into *common*, *slaty*, and *earthy* chlorite. The first of these contains the granular or crystalline varieties; the second embraces those which exhibit a slaty texture; earthy chlorite consists of such as are but loosely coherent, or already in a state of loose, scaly particles. Immediately with those varieties of chlorite whose composition is impalpable, *green earth* is connected. Ordinary talc comprehends the varieties of pale-green, particularly apple-green, gray, and white varieties, and is divided, in popular language, into *common*, *earthy*, and *indurated* talc. Simple varieties are common talc; also such compound ones in which cleavage is transformed into slaty structure, or such as consist of columnar particles of composition: earthy talc or *nacrite* consists of loose particles, or such as are but slightly cohering; the name indurated talc refers to imperfect and coarse slaty varieties, in which this kind of structure is more the effect of composition than of imperfect cleavage. If this structure be sufficiently imperfect to become coarse and indistinctly granular, *potstone*, *soapstone*, *lapis ollaris*, or *steatite* is formed, which, possessing the united properties of softness and tenacity, may be easily turned and wrought into vessels. A recent analysis of talc gives the composition:  $\text{SiO}_2$ , 62.27,  $\text{Al}_2\text{O}_3$ , .15,  $\text{Fe}_2\text{O}_3$ , .95,  $\text{MgO}$ , 30.95,  $\text{FeO}$ , .85 per cent; practically corresponding to the empirical formula  $\text{H}_2\text{Mg}_3\text{Si}_2\text{O}_{12}$ . Common talc, indurated talc, steatite, potstone, and slaty chlorite, constitute beds of themselves in primitive mountains. The varieties known under the name of potstone have been in use for the construction of a variety of utensils from time immemorial. Green earth is sometimes used, both raw, as a green colour, and burned, as a reddish-brown colour, for painting houses, &c. The Venetian talc, a variety of common talc, of a greenish-white colour, formerly used as a medicine, seems to be no longer in use, except for the purpose of removing oil-spots from woollen clothes. Talc is also used as a lubricant, and in paper-making. See POTSTONE, SOAPSTONE, and STEATITE.

TALEGALLA. See TALLEGALLA.

TALENT. See DRACHMA.

TALSMEN. See JURY.

TALFOURD, SIR THOMAS NOON, Knt., a celebrated dramatic author and poet, was born at Reading on May 26, 1795, and died at Stafford on March 13, 1854. He was brought up at Reading, where his father was a brewer. Having adopted the law as a profession, he was, in 1821, called to the bar, but during the earlier years of his legal career he mainly supported himself by his literary labours, chiefly as a contributor to various periodicals. But notwithstanding his literary predilections, he applied himself with steadiness to the cultivation of his profession, in which he slowly, though surely, rose to eminence, and in 1833 he was made serjeant-at-law. In 1835 and 1837 he was returned to Parliament as one of

the members for Reading; and about the same period began to be first known to the public as a dramatic author, having produced at Covent Garden, in 1836, his tragedy of *Ion* (published the previous year), which achieved distinguished success. The tragedies subsequently produced by him were: *The Athenian Captive*; *Glencoe*, or *the Fate of the Macdonalds*; and *the Castilian*, an historical tragedy. None of these had the same success as the first, and the last was never acted. As a dramatist his excellence lies more in beauty of language and sentiment than in the development and maintenance of dramatic interest. In 1847 Mr. Talfourd was again returned member for Reading; and he retained his seat till 1849, when he was raised to the bench in the Court of Common Pleas, and received also, at the same time, the honour of knighthood. He died suddenly while delivering his charge to a grand-jury. Besides the dramas above referred to, Sir Thomas Talfourd was the author of a *Life of Charles Lamb*, first published in 1837, and much enlarged in a subsequent edition in 1848. He also published, in 1845, *Vacation Rambles and Thoughts*, being reminiscences of three continental tours in the vacations of 1841, 1842, and 1843; and to these he added, in 1854, a Supplement to the *Vacation Rambles*, being an account of a journey to Italy in 1846.

TALLACOTIAN OPERATION. See RHINOPLASTIC OPERATION.

TALIPAT PALM (*Corypha umbraculifera*), a species of palm-tree, a native of Ceylon, sometimes mistakenly called the Palmyra-palm, the true Palmyra-palm being the *Borassus flabelliformis*. Its leaves are 18 feet or more in length and about 14 feet in breadth. They are of a coriaceous texture when dried, capable of being folded and again opened repeatedly like a fan, whence it is often called the Fan-palm. They readily receive an impression from any hard point; and all the chief Buddhist works in Pali or Singhalese in Ceylon are engraved upon laminae of these leaves with either a brass or an iron style. The ribs of the leaves are of the texture of cane, which adds greatly to their strength. When the tree is about eighty years old, having then attained its full growth, reaching a height of 60, 70, or 100 feet, the flower-spike bursts from its envelope or spathe with a loud report. The flower-spike is then as white as ivory. In the course of fifteen or twenty months it showers down its abundance of nuts. This effort to provide a numerous succession proves fatal to the parent, which generally dies when its fruit is matured. The flower-spike is occasionally 30 feet long. In times of great scarcity the natives of India cut down this palm and extract the pith for food. It very much resembles sago in its qualities. The blossoms have such a strong heavy smell that the natives cut them down and destroy them when in the vicinity of their cottages. The fruit is round and very hard, about the size of a cherry, and so abundant that one tree will produce sufficient to plant a whole country. It is not edible. See the illustration at article PALMS.

TALISMAN, a figure cast or cut in metal or stone, and made, with certain superstitious ceremonies, at some particular moment of time, as when a certain star is at its culminating point, or when certain planets are in conjunction. The talisman thus prepared is supposed to exercise extraordinary influences over the bearer, particularly in averting disease. In a more extensive sense the word is used to denote any object of nature or art the presence of which checks the power of spirits or demons, and defends the wearer from their malice. The amulet (which see) is much the same as the talisman in this wider sense of the word, though, according to some,

It is more limited in its virtues. As they were both used most frequently, and perhaps originally, to avert disease, we find them playing a conspicuous part in the history of medicine among all nations, from the earliest to the most recent periods. The nature of the talisman has been very different among different nations. The Egyptians made use of images of their gods and of sacred animals, such as the ibis and the scarabeus; the Jews used the phylacteries inscribed with passages from the Old Testament (a section of the cabala is devoted to teaching the construction of talismans); the Greeks used little tablets having written upon them various magical words, such as the Ephesian words, or those written on the feet, the girdle, and the crown of the statue of Artemis at Ephesus; the Romans employed various idols, which they suspended upon the body by chains; the Arabians and Turks make use of sentences from the Koran; and we also find in the East medals of particular metals struck under a particular constellation, and marked with magical signs; in the middle ages, relics, consecrated candles, and rods, rosaries, images, of saints, &c., were employed, and still are, in some parts of Christendom. In the middle ages astrology and the knowledge of the virtues of talismans and amulets formed an important part of medical science; and the quacks of modern times sometimes have recourse to similar means.

**TALITRUS.** See SANDHOPPER.

**TALLAHASSEE**, a town in the United States, the seat of government of the state of Florida, on a commanding height washed by a small stream. It lies in Leon county, about 26 miles from Port Leon in Appalachie Bay, with which it is connected by railway, and 194 miles east of Mobile. It is laid out with great regularity. The chief buildings are the capitol, the court-house, and the West Florida Seminary. The town is connected by rail with the seaport of St. Marks, about 26 miles distant. Pop. (1890), 2934.

**TALLARD, CAMILLE DE LA BAUME, DUC DE HORTUN, COMTE DE**, Marshal of France, descended of an ancient family of Dauphiny, was born in 1652, entered the army young, and after serving under the Great Condé in Holland was engaged under Turenne in Alsace in the brilliant campaigns of 1674 and 1675. He distinguished himself subsequently on various occasions, and in 1693 was made a lieutenant-general. In 1698 he was sent ambassador to England, to negotiate concerning the succession to the crown of Spain on the death of Charles II. In 1702 Tallard was appointed to the command of the French troops on the Rhine, and soon after was honoured with a marshal's staff. He subsequently defeated the Imperialists before Landau, and having taken that place after a short siege (November, 1703) announced his success to Louis XIV. in the following terms: 'I have taken more standards than your majesty has lost soldiers.' In 1704 he was opposed to Marlborough; and being taken prisoner at the battle of Blenheim, was carried to England, where he remained seven years. On his return to France, in 1712, he was created duke; and in 1726 was appointed secretary of state. His death took place in 1728.

**TALLEGALLA**, or BRUSH TURKEY (*Tallegalla*), a remarkable genus of Rasorial Birds, belonging to the family of Megapodidae, or Mound-birds, and distinguished as a genus by the bill having its sides compressed, by the head and neck being naked, and by the opening of the nostrils existing in a membranous groove. The wings have their fifth and sixth quills of equal size and longest. The tail is long and rounded. The tarsi are strong, feathered below the knee, and are covered with scales in front. The toes are elongated, and provided with sharp,

strong claws. The *Tallegalla Lathamii* is the best known species, and that usually designated by the distinctive name of 'Brush Turkey.' It inhabits Australia, where it is also known by the names 'Wattled Tallegalla' and 'New Holland Vulture'—this latter name having reference to the naked vulturine head and neck. It chiefly occurs in New South Wales, and is of gregarious habits, and of wary, suspicious nature. The average size is about that of an ordinary turkey, the females being less than the males. The male when full grown is coloured of a blackish-brown above and below, with grayish tints on the back. The head and neck are covered with very small feathers of blackish hue, whilst a large wattle, coloured bright or orange yellow, depends from the front of the neck. The wattle of the female bird is of smaller size than that of the male. The food appears to consist chiefly of seeds and insects. These birds evince much activity when pursued, their most successful adversary being the Dingo, or native dog, which frequently runs them down. They are remarkable on account of the 'egg-mound' which they form for the purpose of therein depositing their eggs. This mound, which is formed by the exertions of several birds, is of conical shape, and consists chiefly of decaying vegetable matter, to the amount in some cases of two to four cart-loads. The materials are collected solely by the feet of the birds. Within the mass of matter thus collected the eggs, each averaging about 4 inches in length, are laid, deposited at a distance of from 9 to 12 inches from each other, being buried about 12 inches deep in the mound. Very large numbers of eggs may sometimes be obtained from a single mound; and (as determined from observations made upon some of these birds which bred in the Zoological Gardens of London) the male attends the mound very assiduously during the period of incubation, uncovering the eggs in very warm days to prevent the too sudden increase of heat. The young birds on leaving the egg appear to possess well-developed feathers, and remain in the mound without attempting to leave it for at least twelve hours, being covered up by the male. On the second day they leave the mound, but appear to be again covered up at night by the male. On the third day the young birds are able to fly. The eggs are greatly sought after on account of their delicious flavour; whilst the birds themselves are generally taken or shot when they assemble at mid-day under the foliage of trees. They appear to be stupefied and bewildered by the mere report of a gun. An allied species to *T. Lathamii* is the *T. Cuvieri*, found in New Guinea; whilst a third species (*Megacephalon maleo*) is said to inhabit Celebes.

**TALLEYRAND-PÉRIGORD, CHARLES MAURICE DE**, a celebrated French diplomatist, born at Paris in 1754; died there May 17, 1838. Though he was the eldest of three brothers he was, in consequence of a lameness caused by a fall, prevented from entering the army, which was in France at that time one of the rights of primogeniture, and devoted, against his will, to the priesthood. He commenced his studies at the Collège d'Harcourt, continued them at the Seminary of St. Sulpice and at the Sorbonne, and completed them at Rheims, where an uncle of his was archbishop. In 1780, when he was only twenty-six years of age, he was appointed general agent to the clergy, and in 1789 he was consecrated Bishop of Autun. To carve out for himself a political career, after he found his spiritual functions inadequate to satisfy his ambition, he attached himself to Mirabeau, who was then connected with the minister of finance, Calonne. Mirabeau recommended the abbé to the minister. At this time Talleyrand, at the court of Versailles, displayed all the qualities of a polished,

witty, and gallant courtier. But he soon left the court party and joined the Republicans when he saw what the issue was likely to be. On the meeting of the states-general he was elected deputy for Autun, and voted soon after they opened for merging the three estates into one national assembly. The court in astonishment tried in vain to stop him in his career. After the storming of the Bastille he was chosen by the national assembly one of the committee which was to issue an account of their proceedings. An important step which added greatly to his popularity, though it at the same time greatly increased the hatred of his own order, was the leading part which he took in the confiscation of the property of the clergy. At this time he founded, in concert with Lameth, Barnave, Lafayette, Mirabeau, Siéyès, and Sully, the Society of the Friends of the Constitution, out of which the Jacobin Club afterwards arose. He soon retired from it, however, as too republican for him, and along with some friends in 1789 founded the society which was known as the Club des Feuillants. Here he exerted himself for a monarchy, surrounded by democratic institutions. On the 16th of February, 1790, he was elected president of the national assembly, and on the 14th of July of that year, the first anniversary of the fall of the Bastille, he presided in that capacity at the memorable solemnity of national federation in the Champ de Mars. About this time he was the author of various important administrative proposals relating to finance, registration, and education. His registration scheme was adopted, and forms the basis of that still in force in France. His plan of a system of public education, which was both comprehensive in its scope and full in details, was laid before the constituent assembly too late for its merits to be discussed; but there can be no doubt that it was of great service to the subsequent assemblies which took up the problem. When the civil constitution of the clergy was framed he gave his adhesion to it, and he ordained the first constitutional clergy. For this he was immediately excommunicated by a Papal brief, and embraced the opportunity to renounce his episcopal functions (April, 1791). On two occasions in 1792 he was sent to London charged with diplomatic functions, although bearing no official position. After his return on the second occasion (August, 1792) he was accused by the Jacobins of cherishing royalist sympathies, and would certainly have been made a victim had not Danton rescued him and sent him back in safety to London (September). This was the most unfortunate period of Talleyrand's life. Suspicious papers by him were also found among those of the king. The charges against him in consequence gained strength; and by a decree of the convention he was placed on the list of emigrants, which precluded his return to France. In January, 1794, he was ordered to leave England, and he thereupon proceeded to North America; but he only waited for the downfall of his enemy, the terrorist Robespierre, to return to Europe. By the intervention of Madame de Staël the decree against him was recalled in 1795. After his arrival in Paris the opposition which he met with from Carnot prevented him from being employed, and kept him in bad odour. He therefore tried to join the Count of Provence and the emigrants, but they would have nothing to do with him. At last, by exerting himself in the Constitutional Club, he succeeded in 1797 in gaining the ministry of foreign affairs; but being suspected of keeping up an understanding with the agents of Louis XVIII. he was obliged to resign in July, 1799. He now devoted himself entirely to Bonaparte, whom he had early recognized as the master spirit of the time, and after Bonaparte's return from Egypt contributed greatly to the events

of the 18th Brumaire (10th November, 1799), when the directory fell and the consulate began. He was then appointed minister of foreign affairs, and took the lead in the negotiations for the Treaties of Lunéville and Amiens. In 1802, having been released by the pope from his vow of celibacy, he married a Mrs. Grant, with whom he had for some time maintained an illicit connection. There is now no doubt that he was a chief promoter of the murder of the Duc d'Enghien in March, although he afterwards denied all complicity in it. After the establishment of the empire in 1804 he was appointed to the office of grand-chamberlain. In December, 1805, after the conclusion of the campaign against Austria, he negotiated the Peace of Presburg, and in the following year he exerted himself for the elevation of Louis Bonaparte to the Dutch throne. A month after (June 5, 1806) he was created Prince of Benevento. After the battle of Jena he was very active, and concluded the Peace of Tilsit with Russia and Prussia (July, 1807). From this time, from what cause is not well known, a coolness took place between him and Napoleon, and became more and more marked. In 1808 he secretly joined a Royalist committee. He effected a reconciliation with Fouché, and the two began to intrigue in common for Napoleon's downfall. Talleyrand, indeed, before the expedition to Russia, was designated for the post of ambassador at Warsaw, but was obliged to yield it to the Abbé de Pradt, as the emperor was always becoming more suspicious of him. On the first news of the unsuccessful issue of the Russian expedition, which he had foreseen and declared, he placed himself in communication with Louis XVIII., and had great difficulty in escaping the consequences of Napoleon's anger. During the emperor's disasters he joined the Congress of Chatillon, received the Emperor of Russia into his hôtel, and used for his watchword the Maintenance of Legitimacy—an expression which afterwards came much into vogue. It was he who, on 1st April, 1814, established a provisional government, placed himself at the head of it, and procured Napoleon's abdication. He afterwards exerted himself very effectually in re-establishing Louis XVIII. on the throne of his ancestors. He was busily engaged at the Congress of Vienna when news arrived that Napoleon had landed from Elba. He took part in the declaration then issued characterizing Napoleon as a disturber of the peace. When in 1815 the allies again entered Paris he again became president of the council with the portfolio of foreign affairs; but as he refused to sign the second Peace of Paris he gave in his resignation.

With the commencement of constitutional government in France and the internal struggles connected with it Talleyrand's principal career was properly concluded. In the first years of the restoration he often appeared at the palace and gave good counsel, of which the reigning party made no use. In the house of peers he often voted with the opposition, defended the freedom of the press, and condemned the Spanish campaign of 1823. When he saw the rocks on which the restoration would be wrecked he withdrew, particularly after the coronation of Charles X., and retired to Valençay, keeping open house, and giving a welcome reception to all who had distinguished themselves either by literary or political service. In his social intercourse Talleyrand always exhibited the grandee of olden times. Naturally indolent he himself worked as little as possible, but he was well acquainted with the art of turning others to account and getting them to work for him. In ordinary business he managed with ease, and skilfully skimmed the surface of things, but he did not possess the talent of speaking on the spur of the moment on important emergencies. Probably this defect led him to the

adoption of one of his fundamental axioms, never to explain one's self at the moment. He was often accustomed to say, what Goldsmith however had said long before him, that language had been given to man to enable him to conceal his thoughts. On the occasion of the July revolution of 1830 he at first kept entirely aloof. Louis Philippe, however, before accepting the throne, asked his advice, and received the short answer that he should take it. When, by the revolutions in Belgium and Poland, in connection with other circumstances, the July throne became endangered, Talleyrand at last came forward, and finally abandoning the old dynasty and his own work united with Louis Philippe for the maintenance of the peace of Europe. In September, 1830, he went as ambassador to London, and made all kinds of exertions calculated to show off the peaceable intentions of the July dynasty. To him mainly was it owing that Austria and Prussia joined the conferences of the three powers which had decided the fate of Greece, and that after endless protocols the powers united in their views with regard to Belgium. After these results he turned to what had long been his favourite idea, the formation of a combination of France, Britain, and Austria against Russia. The plan was partly successful when in 1834 he subscribed the quadruple alliance (the parties to which were France, England, Spain, and Portugal), which was intended above all to guard the constitutional principle in Western Europe. With this act, by which he thought to have closed the revolutionary epoch, he closed his career and withdrew from the stage of public life. He returned from London in 1835, and withdrew to Valençay, though old age had not impaired his mental vigour. He repeatedly made his appearance at the court of the citizen-king, where he was received with great distinction, and revered by the ladies as an oracle. Before his death he submitted to the formalities of the Roman Church, and had even several years before drawn up a deed in which he formally retracted whatever he had done against it. The deed, however, had not been signed, and he only consented with some reluctance to sign it a few hours before his death at the urgent request of some of his friends. The principal part of his immense property, estimated at about 18,000,000 francs (£720,000), he left to his niece, the Duchess of Dino. He left memoirs in manuscript which were to remain unpublished till thirty years after his death. They have proved of little value.

TALLIEN, JEAN LAMBERT, a French revolutionist, born at Paris in 1769, who first made himself widely known by publishing a revolutionary journal called *Ami du Citoyen*. He soon became one of the most popular men of the revolutionary party, and was deeply concerned in the terrible commotions of the 10th of August, at which time he was secretary of the commune which had installed itself at the *Hôtel de Ville*. Being nominated a deputy to the convention from the department of Seine and Oise, he distinguished himself in that body by the violence he displayed in the process against Louis XVI, even objecting to the king being allowed counsel to defend him. He took part in most of the sanguinary proceedings which occurred during the ascendancy of Robespierre, and in 1794 he was sent on a mission to Bordeaux, where he showed himself the worthy associate of Carrier, Lebon, and Collot d'Herbois. He was checked in this sanguinary career by the influence of Madame de Fontenay, a woman remarkable for her personal beauty, who, having been imprisoned at Bordeaux as she was going to join her family in Spain, owed her life to Tallien. He took her along with him to Paris, whither he went to defend himself before the convention against the charge of moderation. After the fall of Danton and

his party Tallien perceived that he should become one of the next victims of Robespierre if he did not strike the first blow. Accordingly, at the sitting of the convention of the 9th of Thermidor (July 27, 1794) he vehemently assailed Robespierre, and it was mainly by his influence that the latter with his friends was brought to the guillotine. (See ROBESPIERRE.) At this period he married his *protégée*, Madame de Fontenay. Having been nominated a member of the committee of public safety, he used all his influence against his former associates, Fouquier-Tinville, Carrier, Lebon, &c., and demanded the suppression of all the revolutionary committees. In 1795 he was sent as commissioner of the convention to the army of Hoche in Brittany, and if it was not by his orders, it was at least with his permission, that the royalist prisoners captured by that army at Quiberon were shot. He subsequently became a member of the Council of Five Hundred, but his influence gradually declined. In 1798 he accompanied the savants attached to Bonaparte's Egyptian expedition, but after Bonaparte left Egypt General Menou treated Tallien harshly, and obliged him to return to France. The vessel in which he sailed was captured by the British, and he was taken to London, where he received much attention from the leaders of the Whig party. On returning to France he found his importance altogether gone, and was glad to accept the office of French consul at Alicante. He afterwards returned to Paris, where he died in poverty and obscurity in 1820.

TALLIS, THOMAS, a celebrated musician, and author of some of the finest chants in the cathedral service of the English Church, was born about 1510. He is said, though on insufficient evidence, to have been organist of the chapel royal in the reigns of Edward VI. and Mary; but it is certain that he filled that office in the reign of Elizabeth. William Byrd, the distinguished musician, was a pupil of his, and along with him he published in 1575 a collection of motets and hymns. Tallis is the author of the music of the Venite Exultemus, the Te Deum, the Magnificat, the Nunc Dimittis, and other pieces in the English service. He died in 1585.

TALLOW, the harder and less fusible fats melted and separated from the fibrous matter mixed with them. These fats are usually of animal origin, the most common being derived from sheep and oxen. Animal tallow consists essentially of stearin, palmitin, and olein (which see), the more solid tallow containing a proportionately larger quantity of the first-named substance. In preparing tallow the separation of cellular tissue and fibrous substance is greatly facilitated by the addition of a small quantity of dilute sulphuric acid. (See FAT.) The quality of tallow depends partly on the animal from which it has been prepared, and partly on the care taken in its purification. It is firm, brittle, and has a peculiar heavy odour. When pure it is white and nearly insipid; but the tallow of commerce has usually a yellowish tinge, which may be removed by exposure to light and air. Tallow is divided, according to the degree of its purity and consistence, into candle and soap tallow. It is manufactured into candles and soap, and is extensively used in the dressing of leather, and in various processes of the arts. In 1901 the British imports of tallow and stearine were as under:—

From Australia .....	663,469 cwts.
" United States .....	408,942 "
" New Zealand .....	321,623 "
" Argentine Republic .....	204,494 "
" Other countries .....	191,791 "
Total .....	1,785,319 cwts.

The gross value was £2,333,246.

**TALLOW-TREE** (*Stillingia sebifera*). This interesting tree is a native of China. It belongs to the natural order Euphorbiaceæ, and it has been described as one of the largest, the most beautiful, and the most widely diffused of the plants found in the Chinese empire. It is abundant throughout the country from Nankin to Canton. The flowers are inconspicuous, and disposed in straight terminal spikes; the capsules are hard, smooth, and brown, divided internally into three cells, each containing a nearly hemispherical seed, which is covered with a sebaceous and very white substance. At the close of the season the leaves turn bright red, and as the capsules fall off, leaving the pure white seeds suspended to filaments, the tree presents a very beautiful appearance. From a remote period this tree has furnished the Chinese with the material out of which they make their candles. The capsules and seeds are crushed together and boiled; the fatty matter is skimmed as it rises, and condenses on cooling. The candles made of this substance are very white, and red ones are also manufactured by the addition of vermilion. Sometimes 8 lbs. of linseed-oil and a little wax are mixed with 10 of this substance to give consistence. The tallow-tree has been introduced into the United States, and is cultivated in the vicinity of Charleston and Savannah, and indeed is almost naturalized in the maritime parts of Carolina. It has also been acclimatized in Algeria through the exertions of the French government.

**TALLY**, a stick divided longitudinally through the middle, formerly in general use as a medium for recording accounts. One half was kept by the debtor and one by the creditor, and when any debt or payment was recorded the two halves were adjusted together, and a notch or some other mark made on them both. This method, however inconvenient in other respects, was an excellent security against forgery, since it would be difficult, if not impossible, for a person to make a false tally correspond with the counter-tally, in all the respects in which the forger wished them to correspond, so accurately as not to be detected as false. When a debt was entirely cleared off, the creditor's tally was given to the debtor. Tallies were in use till the 18th century for keeping accounts in the exchequer of England. The exchequer tallies were four-sided, and on one side the sum charged to the debtor was indicated by notches, a different kind of notch being used for different sums; while on two opposite sides were written the sum in Roman figures, the name of the debtor, and when the debt was paid the date of payment. When the debt was paid the tally was divided, and one half was given to the debtor as a receipt, and the other kept in the exchequer as a record of the transaction. A debtor after paying his account and receiving his tally might obtain a receipt in parchment by carrying the tally to the clerk of the pipe-office and claiming one. The use of tallies was abolished by 23 Geo. III. cap. lxxvii. (1783), and by 4 and 5 Will. IV. cap. xv. (1834) the old tallies were ordered to be destroyed. The burning of them is said to have been the cause of the fire which broke out in October, 1834, and consumed the two houses of Parliament.

**TALLY SYSTEM**, a mode of selling upon credit in which the purchaser agrees to pay for the purchase by fixed instalments at a certain rate, and both seller and purchaser keep books in which the circumstances of the transaction and the payment of the several instalments are entered, and which serve as a tally and counter-tally. (See **TALLY**.) The tally system is made use of to a large extent by the wives of the poor, chiefly in purchasing articles of dress and

finery, and in this way often leads to actions at law, for when the wife has entered into a contract of this nature without the knowledge of her husband for articles that do not come under the head of necessities the husband is not liable for the debt incurred under such contract unless he expressly or by implication give his consent to the purchase which formed the ground of the contract after it has come to his knowledge. It is held to be implicit consent on the part of the husband if he sees his wife wearing the articles so acquired and does not immediately return the articles to the seller, or notify to the latter his repudiation of the purchase.

**TALMA**, FRANÇOIS JOSEPH, the greatest modern tragic actor of France, was born at Paris in 1768. In 1787 he made his début at the Théâtre Français in the character of Séide in Voltaire's *Mahomet*. He was received with applause, and from this moment devoted himself with zeal and perseverance to the study of his art. Talma rendered an important service to the French stage by introducing a reform in the costume. Hitherto the actors had worn the Parisian costumes of the day, but Talma introduced the practice of dressing in accordance with the time and country of the character represented. Chenier's tragedy of Charles IX., or *St. Bartholomew's*, was brought forward in 1789, and Talma studied the character of Charles in history, and his person in medals and portraits, and exhibited them with such truth and life that his reputation as the first French tragedian was established beyond dispute. The principal parts which he created, or carried to the highest perfection, were Séide, Othello, Hamlet (the last two those of Ducis), Sylla (of Jouy), Regulus, the grand-master of the templars (of Lucien Arnault), Charles IX., Charles VI. (of Delaville), Manlius, and Orestes. He did not generally excel in comedy, but he appeared in 1823 with great success in the character of Danville in C. Delavigne's *École des Vieillards*. 'Talma,' says Madame de Staël, 'may be cited as a model of power and of discretion in the use of it, of simplicity and true grandeur. He possesses all the secrets of the various arts; his attitudes recall to mind the fine statues of antiquity, and the expression of his face and every look ought to be the study of our best painters. There is in the voice of this man a magic which I cannot describe; which, from the moment when its first accent is heard, awakens all the sympathies of the heart.' Talma was a great favourite of the Emperor Napoleon. He died in October, 1826, and was buried in the cemetery of Père la Chaise. Talma was the author of a small but very interesting work, entitled *Réflexions sur Lekain et sur l'art théâtral*.

**TALMUD**, a Chaldaic word signifying 'doctrine,' and sometimes used to designate the whole teaching of the Jewish law, comprising all the writings included in what we call the Old Testament, as well as the oral law or Mishna, with its supplement or commentary the Gemara (see **MISHNA**), but more frequently applied only to the Mishna and Gemara, and occasionally confined to the Gemara itself. The present article will treat of the Talmud in the second of these two senses. The main body of the Talmud consists of minute directions as to conduct. 'In every relation of life,' says the writer of an article on the subject in the *Edinburgh Review* (July, 1873), 'in every action, in every conceivable circumstance—for food, dress, habit, language, devotion, relaxation—it prescribes almost every word to be uttered, and almost every thought to be conceived.' Its contents are hence very miscellaneous, and they are as varied in their character as in their subject. Much of it is taken up with regulations of the most puerile nature, and not a little with details only fitted to excite

disgust. In other parts again there are passages containing the loftiest expression of religious feeling, passages which are said to be the source of almost all that is sublime in the liturgy of the Church of Rome, and those liturgies which have been mainly derived from it. Interspersed throughout the whole are numerous tales and fables, introduced for the sake of illustration. It is mentioned in our article *Mishna* that that portion of the Talmud was committed to writing some time in the second century A.D. All Jews are carefully instructed in it, and its very language is sometimes quoted and acknowledged in the New Testament. The injunctions referred to by Christ in the sermon on the mount as having been 'said by them of old time' [properly, the elders] are all from the *Mishna*; and St. Paul's phrase 'The cup of blessing which we bless' (1 Cor. x. 16) is from the same source. The *Gemara*, or supplement to the *Mishna*, was originally an oral commentary, as the *Mishna* was itself an oral supplement to the *Mikra*, or written law. It consisted of the explanations and illustrations which the *Amoraim*—that is, speakers or teachers of the *Mishna*—were in the habit of giving in the course of their lessons. These oral comments were handed down from age to age, differing of course in different localities, and gradually increasing in quantity; and they were at last committed to writing in two forms, the one called the *Jerusalem* and the other the *Babylonian Gemara*, or, with the addition of the *Mishna*, which is common to both, the *Jerusalem* and the *Babylonian Talmud*. The *Jerusalem Talmud* is the earlier and by much the smaller of the two. Of the six orders and sixty-three tracts into which the *Mishna* is divided only four orders and one tract of a fifth are furnished with a commentary in this Talmud, while that of *Babylon* is complete. The *Jerusalem Talmud* is said to bear internal evidence of having been written for an agricultural community, and the other to exhibit equally unmistakable signs of having been designed for a nation of traders. There is considerable uncertainty as to the date of the former. Tradition ascribes the compilation of the *Gemara* belonging to it to Rabbi *Johanan ben Eliezer*, who lived some time in the third century A.D.; but it is said to have received later additions as late as, but probably not later than, the fourth century. The date within which it was completed is fixed by some at 340 A.D. There is more certainty as to the authorship and date of the *Babylonian Gemara*. This compilation is almost entirely the work of Rabbi *Asi* (*Isaiah*) *ben Simai*, who in 370 A.D., at the age of twenty-three, became the head of a Jewish school near *Babylon*. For fifty-two years after this date he is said to have been engaged in the preparation and revision of his great work. For thirty years he is said to have made diligent inquiries of all the most learned men of the East regarding the traditions relative to the teaching of the *Mishna*, and to have taken advantage for this purpose of the great gatherings of the Jews at the festivals. In this way he compiled the *Gemara* section by section, and the remaining twenty-two years of his labour were devoted to the task of revision. Trifling additions were afterwards made by his friend Rabbi *Abina*, and two rabbis record that the *Babylonian Gemara* was not completed in its present form till 500 A.D. The language of both the *Gemaras* is a mixed Hebrew, but that of the *Babylonian Gemara* is much less pure than the other, and differs in purity in different parts. In the doctrinal portions the language resembles that of the *Mishna* and of the *Jerusalem Gemara*; but in the narrative portions, designed as popular illustrations of the other parts, it comes near the Aramaic or vernacular dialect of

the Eastern Jews. The style is in both cases extremely condensed and difficult.

It has been already mentioned that the *Mishna*, with its corresponding *Gemara*, is divided into six orders (*sedarim*) or principal divisions. The subjects of these orders are agriculture, festivals, women, damages, holy things, and purifications. These orders are subdivided into sixty-three tracts, to which the *Babylonian Gemara* adds five others, thus containing sixty-eight tracts in all.

Another division of the Talmud, depending on the nature of its contents, is into *Halaca*, the doctrinal and logical portion; *Hagada*, the rhetorical or imaginative portion; and *Cabala*, the mystical portion, including theosophy and magic. Much of the *Hagada* is due to the *Essenes*, who were fond of giving an allegorical interpretation to the law. The ghost-lore is to a large extent contributed by a sect called the *Mehestanites*, who arose about the time of the captivity, and derived from Persian sources a belief in good and evil spirits and in astrology. The *Misraimites*, who date from a period a little later than *Alexander the Great*, are the original source of all that part of the *Cabala* which is distinguished by assigning a hieroglyphical significance to the forms of letters, and is called the numeric, graphic, or figurative *Cabala*. Their views on this matter were the result of Egyptian influence.

Of the *Mishna* alone there are four good translations: one by *Surenhusius* into Latin (*Amsterdam*, 1698-1703); one by *Abraham Ruben* into Spanish (*Venice*, 1606); and two into German, the first by *Rabe* (*Ausbach*, 1760), and the second (in which Hebrew characters are used for the German!) by *Jost* (*Berlin*, 1832). Editions of the text accompany the translations of *Surenhusius* and *Jost*. A translation of eighteen of the tracts of the *Mishna* into English, by *De Sola* and *Raphall*, was published in one vol. at *London* in 1843. *Streane's The Treatise Chagigah* (1891) is the first English translation of a complete Talmudic treatise, both *Mishna* and *Gemara*. Translations into Latin of twenty of the tracts of the *Jerusalem Gemara* and three of those of the *Babylonian* are to be found in *Ugolino's Thesaurus*, and translations by the same scholar of twenty-three other tracts exist in manuscript. A French translation of the first tract of the Talmud (both of *Mishna* and *Gemara*) by the *Abbé L. Chiarini*, professor of oriental languages at the *Royal University of Warsaw*, was published at *Leipzig* in 1831. The treatise translated is called *Berachoth*, and contains the laws regulating prayer and worship. This publication is an excellent one for giving a good general idea of the Talmud, not only because the translation of one treatise enables the reader to understand the structure of the whole Talmud, but also because the translator in his preface gives an excellent sketch of the remaining treatises. A French translation of the whole by *Dr. M. Schwab* was completed in 1888. Among aids to the study of the Talmud are *Dr. Pinner's Einleitung in den Talmud* (1842); the article in *Herzog's Real-Encyclopädie* (3rd edn., 1896 onwards); the article in *Deutsch's Literary Remains* (1874); the article in the new *Jewish Encyclopædia*, now in course of publication; *Jastrow's Dictionary of the Targumim, Talmud, &c.* (1886 onwards); *Strack's Einleitung in den Talmud* (1887); and *Rabbinovicz's Législation Civile du Talmud* (1878-80), and *Législation Criminelle du Talmud* (1876).

TALPA. See MOLE.

TAMANDUA, TAMANOIR. See ANT-EATER.

TAMARIND-TREE (*Tamarindus Indica*), a large and beautiful tree of the East and West Indies, belonging to the natural order *Leguminosæ*. The



leaves are pinnate, composed of sixteen or eighteen pairs of sessile leaflets. The flowers are disposed, five or six together, in loose clusters; the petals are yellowish, and beautifully variegated with red veins. The pods are thick, compressed, and of a dull brown colour when ripe. The seeds are flat, angular, hard, and shining, and are lodged in a dark, soft, adhesive pulp. The tamarind-tree exists also in Arabia, Egypt, and other parts of Africa. In the West Indies the pods are gathered in June, July, and August, when fully ripe; and the fruit, being freed from the shelly fragments, is placed in layers in a cask, and boiling syrup poured over it till the cask is filled; the syrup pervades every part quite down to the bottom, and when cool the cask is headed for sale. The East India tamarinds are darker coloured and drier, and are said to be preserved without sugar. This fruit has an agreeable acid and sweetish taste, is refrigerant and gently laxative. A simple infusion in warm water forms a very grateful beverage, which is advantageously used in febrile diseases. The Turks and Arabs carry the pods, prepared with sugar or honey, either green or ripe, in their journeys across the deserts; and they are found to constitute an agreeable and wholesome article of food.

**TAMARISK**, the name of several shrubs belonging to the natural order Tamaricaceæ, and mostly to the genus *Tamarix*. Tamarisks are of an elegant form, with slender stems and branches, and very small alternate leaves in the form of sheathing scales. Their flowers are white, rose-coloured, or purple, and are arranged in simple spikes or panicles. They are very abundant all round the Mediterranean, but are not found south of the equator. The *Tamarix gallica*, or French Tamarisk, grows on the banks of the rivers and along the coasts of Languedoc and Provence. It attains the height of from 16 to 20 feet, has small flowers of a bright rose colour, and altogether has a very attractive appearance, which makes it very much sought after as an ornament for shrubberies and parks. It flowers in May. Its wood grows rapidly, and is well adapted for firewood. Its ashes, as well as those of the *Tamarix africana*, contain considerable quantities of sulphate of soda. The *Tamarix mannifera*, when punctured by an insect which infests it, yields a sweet gummy substance, to which the name of Mount Sinai manna is given, but which is found to consist of pure mucilaginous sugar, and no mannite. (See MANNA.) The German Tamarisk (*Myricaria Germanica*) is a member of an allied genus, with monadelphous stamens.

**TAMAUlipas**, a state of the Mexican Republic, on the Gulf of Mexico; area, 27,916 square miles. The coast here is low-lying, and fringed with lagoons, separated from the sea by belts of sand, which are very favourable to coast navigation. In the northern part of the state the flatness of the coast is continued to some distance inland, and then rises into elevated, though still comparatively level plains. To the south the surface becomes finely diversified by mountain, hill, and valley. The most important streams are the Rio Grande, which forms the northern boundary; the Fernando or Tigre; and the Santander. The climate of the interior is temperate and healthy, but on the coast, especially in the hot season, is almost pestilential. The soil is generally fertile; and the vegetable products include, beside the ordinary grains, maize and sugar-cane. Cattle in vast numbers—horses, mules, sheep, and goats to a less extent—are reared; and a considerable trade, both in them and in other articles, is carried on chiefly with the states of San Luis Potosi, Zacatecas, and Queretaro. The foreign trade is carried on chiefly at the ports of Tampico and Matamoros. Capital, Victoria. Pop. (1900), 218,948.

**TAMBOURINE**, a musical instrument of the drum species, much used among the Biscayan and Italian peasants. It consists of a piece of parchment stretched over the top of a broad hoop, which is furnished with little bells. It is sounded by sliding the fingers along the parchment, or by striking it with the back of the hand or with the fist or the elbow.

**TAMBOUR-WORK**, a species of embroidery introduced into Britain in the course of the 18th century. A single tambour worker usually sits at a low circular frame, over the top of which the silk, linen, or muslin is stretched by means of a hoop, much in the same way as the head of a drum is tightened. A frame of different construction is used when several workers are employed on the same fabric, consisting principally of two rollers, which, when properly fixed, stretch the linen, &c., to the necessary degree of tension. As the work proceeds the finished part is wound over one roller, whilst a fresh surface is at the same time unwound from the other. The needle, which is about  $\frac{1}{2}$  inch in length, terminates in a small hook with the point curving inwards. This is fixed in a handle of bone, ivory, or wood, of the thickness of a quill, by means of a small screw on the side. The worker, holding the thread on the under side of the frame, passes the needle through the muslin, &c., from the upper side, and by a continued series of loops interwoven together, succeeds in producing a very minute and beautiful chain line, with which she traverses the outline of any pattern previously sketched upon the fabric she is employed to ornament. Machines have been constructed for tambour working, and continue to be used with success. Yet the practice of tambouring is dying out, being replaced by pattern-weaving, by which tambour work can be closely imitated.

**TAMBOV**, a government in Russia, bounded north by Nijnei-Novgorod and Vladimir; west by Riazan, Tula, and Orel; south by Voronej; and east by Saratov and Penza; area 25,676 square miles. It forms an extensive plain, occasionally broken by low hills. In the south it assumes the appearance of a steppe, and is so thinly wooded that large tracts are absolutely without a tree. In the north the surface consists generally of a light unfertile sand, contains numerous marshes, and has several extensive forests yielding good ship-timber. The government is watered by the Volga and the Don, but the want of moisture is much felt in the south. About half the surface is arable. The corn raised leaves a large surplus for export. After corn the principal crop is hemp. Vast numbers of excellent horses, cattle, and sheep are reared. The only mineral of any consequence is iron. The staple manufactures are woollen cloth, leather, soap, and candles. The trade is important, and consists in corn, cattle, honey, soap, butter, cheese, wool, hemp, and iron. Tambov is the capital. Pop. (1897), 2,715,453.

**TAMBOV**, a town in Russia, capital of the government of the same name, on the left bank of the Tzna, at the confluence of the Studenetz, 263 miles south-east of Moscow. It is an ancient place, surrounded by a dilapidated rampart, and is built chiefly of wood. It contains a gymnasium, military school, ecclesiastical seminary, female institute, house of correction, and infirmary; is the residence of a governor, the see of a bishop, and the seat of several important courts and public offices; and has breeding studs, manufactures of woollens and sailcloth, leather, soap, and tallow, an alum and a vitriol work, and a considerable trade with Moscow and St. Petersburg in tallow, leather, wool, and provisions. Pop. (1897), 48,134.

**TAME ANIMALS**, in law. These may be naturally either of a mischievous and dangerous disposition, such as lions and bears; or of a harmless disposition,

such as sheep, cows, and even dogs. The owner of a tamed animal which is naturally fierce is bound to keep it secure, and in case of its being allowed to escape and doing any injury he will be held liable for the damage unless he can prove that the escape of the animal was not in the slightest degree due to negligence on his part. When, on the other hand, the animal is naturally harmless, but does some injury in an unexpected exhibition of violence, the owner is practically not held liable, unless it can be proved that he was previously acquainted with the violent temper of the animal. He is thus usually freed from responsibility for the first offence of an animal of this nature belonging to him, but is held responsible if the offence is repeated, at any rate if it can be shown that he has not taken due precaution to prevent its repetition. The only exception to this rule is in the case of dogs worrying sheep or cattle. In this case the owner is always held liable for the damage done, whether he knew of the animal's propensity or not. It is lawful to set traps in fields for tame animals, but these must not be fixed near a highway, lest the animal be attracted by the bait to trespass when otherwise there was no reason to suppose that it would do so.

TAMERLANE. See TIMUR.

TAMIAS. SEE SQUIRREL.

TAMIL (more properly *Tamir*, sometimes erroneously spelled *Tamul*), the name of an Indian race which inhabits the most southern part of the Indian peninsula, stretching from the east coast to the west. The Tamilians belong to the Dravidian stock of the inhabitants of India, and are therefore to be regarded as among the original inhabitants who occupied the country before the Aryans invaded it from the north, and gradually imposed upon the people their language, culture, religion, and manners. The people of southern India kept themselves comparatively free from foreign admixture, although they adopted the higher civilization of the Aryans; and the Tamilians are those who have appropriated and developed the Aryan civilization in the most distinctive and characteristic manner.

The Tamil language is spoken over a large tract of land in the extreme south of India; it is spoken to a great extent in Ceylon; it is spoken also by a majority of the Indian settlers in places farther east, as Pegu, Penang, &c.; and in many parts of Southern India, even where it is not the vernacular, it is spoken by the better classes of Hindus. The structure of the language is very simple. It has two dialects: the higher (Shen-tamil), now used in poetry, is the more ancient of the two; the lower (Kodun-tamil) is the language of common life. The literature of the Tamil language, the earliest extant works of which are supposed to be as old as the ninth century of our era, embraces nearly every branch of the knowledge of Northern India. The most interesting portion of this literature is the collection of gnomic poems or proverbs (Kural) of Tiruvalluvar, which has been edited with notes, grammar, introduction, concordance, lexicon, and translation, by Dr. Pope (1886). Dr. Pope has also issued an edition, with translation, of the poem *Nāladīyar* (1893). See Caldwell's *Comparative Grammar of the Dravidian Languages*, Lazarus's *Tamil Grammar* (1878), and Pope's *First Lessons in Tamil* (new edn., 1891); dictionaries by Rottler (1834-41), Winslow (1862), and others; Graul's *Bibliotheca Tamilica* (four vols., 1854-65).

TAMMUZ, a proper name occurring in Scripture, but only once, in Ezekiel viii. 14: 'Then he brought me to the door of the gate of the Lord's house which was toward the north; and, behold, there sat women weeping for Tammuz'. According to Mr. Sayce (in *Hastings' Dictionary of the Bible*) Tammuz was

originally the Sun-god, and was a Babylonian deity whose worship was early imported into the west, the name being in Sumerian, *Dumu-ri*, 'the son of life'. In Canaan Tammuz was addressed as Adonai, 'my lord', whence the Greek Adonis; and as Tammuz was originally associated with the Babylonian goddess Istar (Astarte), so Adonis was associated with Aphrodite. The Vulgate agrees with this explanation by its rendering of Tammuz as Adonis. This worship was much practised among the Phœnicians, and was celebrated chiefly at the Phœnician town of Byblus. The ceremony was prolonged through different scenes. Adonis was supposed to have been killed by a boar; search was made for him, a wooden image being provided to represent Adonis, and on his being found, wild and licentious orgies commenced, and the burial of the idol terminated the first portion of the pageant. The river of Adonis, or Nahr Ibrahim, at the season of the year at which this worship took place, becomes discoloured from the heavy rains on Lebanon, and in the popular superstition the stream

'from his native rock  
Ran purple to the sea, supposed with blood  
Of Tammuz, yearly wounded'.

The resurrection of Adonis next followed in the ritual, and was celebrated with frantic rejoicings mingled with the grossest social debauchery. This idolatry appears to have been originally symbolical, connected with the sun's decline in winter and his returning strength in summer, or with the death of nature and its revival in spring. The festival seems to have been held at the summer solstice. Movers and Hitzig place it at the autumnal equinox; but Tammuz is with the Jews the name of the fourth or midsummer month. Jerome also asserts that the anniversary of the death and resurrection of the fabulous Adonis was celebrated in the month of June. It was, however, in the sixth month that Ezekiel's vision happened. The period of celebration might perhaps vary, or the time of the prophet's vision might not be coincident with the actual celebration of the festival. The worship of Adonis was at length suppressed by Constantine. Its rites had been carried over to Cyprus, and from thence to Greece; and Paphos, the chief Cyprian seat of them, became proverbial in its infamy.

TAMMY, TAMIN, TAMINE, or TAMINY, a kind of woollen cloth highly glazed, used for making fine sieves employed in cooking, which are also called tammies. It is also used under the names of *lasting* and *durant* for ladies' boots.

TAMPICO, a seaport town of the Mexican Republic, in the state of Tamaulipas, in the extreme south of the state, near the mouth of the Tampico, which is formed by the union of the Tula and Panuco. It is well built on a rising slope of ground, and possesses some very fine houses, both of brick and stone, many of them in the old Spanish style, with flat roofs. It carries on a considerable trade with Great Britain and the United States. Till recently large vessels could not enter the harbour, but it has been greatly improved and is now the best on the gulf. Pop. 8000.—The lake of Tampico is a shallow lagoon at the northern extremity of the state of Vera-Cruz, 15 miles long by 10 miles broad.

TAMSUI, also *Hobé* or *Kobé*, a seaport in the north-west of Formosa, at the mouth of the river of the same name, connected by railway with the tea-mart of Twatutia up the river, and also with other towns. Only small coasting steamers can cross the bar at low tide, but a harbour is to be constructed. The imports at Tamsui were valued at £784,231 in 1901, and the exports at £485,979.



The former include rice, opium, timber, pigs, oil, cottons, sugar &c.; and the latter tea, camphor, &c.

**TAMWORTH**, a municipal borough and market town of England, in Staffordshire, on the border of Warwickshire, situated at the confluence of the rivers Tame and Anker, 12 miles north-east of Birmingham. It has a parish church (St. Editha's, restored) which dates in its earliest form from the eighth century, and was formerly collegiate; a Roman Catholic chapel; Nonconformist chapels; a town-hall, presented by Thomas Guy, founder of Guy's Hospital, who also endowed alms-houses in the town; municipal buildings; a grammar-school; public library; assembly-rooms; public baths; a cottage hospital; and an ancient castle, formerly a royal residence, now the property of the borough. Tapes, webbing, clothing, small-wares, and paper are manufactured, and coal-mining, brewing, and dyeing are carried on. Market-gardening is also an important industry, and there are markets for corn, horses, and cattle. Tamworth, which was represented by Sir Robert Peel for twenty-eight years, ceased to be a parliamentary borough in 1885. Pop. (1891), 6614; (1901), 7271.

**TANA**, a river of British East Africa, rising on the southern slopes of Mount Kenia and flowing east and south into the Indian Ocean at Formosa Bay. It is navigable for some kinds of vessels up to Hameye, just below the Hargazo Falls.

**TANACETUM**. See **TANSY**.

**TANAGERS**, the name applied to a sub-family (Tanagrinae) of Insectorial Birds, included in the family Fringillidae, or Finches. These birds are distinguished by the bill being of triangular shape at its base and arched towards its tip. The upper mandible may exhibit a notched appearance; the wings are pointed and of moderate length; the feet short and slender. The hinder toe is strong and elongated, all the digits being provided with strong curved claws. These birds are chiefly found in the tropical parts of America. The food consists of seeds and insects. A great number of genera and species are included in this sub-family. One of the best known is the Organist Tanager (*Euphonia musica*) of the West Indies, so named from the pleasing and varied nature of the song. The genus *Pyranha*, represented by the *P. rubra*, or Scarlet Tanager, which occurs in the United States in summer, is also a familiar genus.

**TANAGRA**, now called *Grenada*, a town of ancient Greece, in Boeotia, on the left bank of the Asopos, 15 miles east of Thebes, the scene of a battle in B.C. 455 between the Athenians and the Spartans, in which the latter were victorious. Tanagra is now a scene of ruins, and excavations on the site since 1873 have brought many interesting objects to light, especially the beautiful painted terra-cotta figures known as *Tanagra figurines*. Most of these are draped female figures from 6 to 9 inches in height, and their value to the student of Greek art cannot be over-estimated.

**TANAIS**. See **DON**.

**TANANARIVO**, or **ANTANANARIVO**, the political capital of the French island and colony of Madagascar, and the head-quarters of the third military territory, in the central massif of the province of Imérina, about 4500 feet above sea-level. It is built on a hill of basalt and granite extending north and south for two and a half miles, with a breadth varying from three-quarters to one and a third mile. The hill slopes gently towards the west, but descends abruptly southward and eastward, and round its base on the south and west flows the river Ikopa, a tributary of the Betsiboka. The distance of the town from the east coast is 100 miles, from

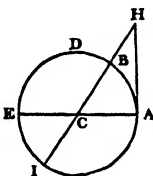
the west coast 225 miles. Many of the buildings were of wood at a quite recent date, but it may now be said that the town is built of brick and granite, with tiled roofs. On the summit of the hill stands the queen's palace, still of wood, but protected by an inclosing structure of masonry, and used by the French authorities for the normal school and the commercial museum. Beside it are the Palais d'Argent, a reduced copy of it; the prime minister's palace, now a barracks; the Palais de Manoandro, now containing a historical museum; and other palaces; and in front of it there are the tombs of the Madagascar kings. In the central part of the town, near the summit, there is the Place Jean-Laborde, around or near which are situated various European habitations and public buildings, the latter including the post and telegraph-office, the treasury, the offices of the French administration, mayoral and police offices, the Anglican and the R. Catholic cathedral, &c. The Place Jean-Laborde is adorned by a kiosk and a garden, and receives the three principal arteries or carriage roads of the town. One of these runs northward, and is occupied almost entirely by European houses. Another goes east towards Tamatave, and the third runs west to the governor-general's palace (1889), which is surrounded by a fine park. The chief commercial portion of the town lies along this western road, and the railway-station will be constructed near it and the Place Richelieu, a former manœuvring-ground of the Hova army. These main roads are connected by shorter and narrower streets, and these in turn are linked by numerous lanes, often extremely narrow. A circular road, suitable for driving, riding, and cycling, goes round the base of the hill. Among institutions not above mentioned are the hospital of Isoavenandriana, built by Englishmen, a mile and a quarter to the north of the town; the Jesuit observatory, constructed in 1890 on a hill to the east, destroyed by the Hovas in 1894, and since rebuilt; a school for technical training; &c. The climate is very healthy, the temperature not exceeding that of southern Europe. The town was permanently occupied by the French on Sept. 30, 1895. Pop. (1897), 47,000, of whom 700 are Europeans.

**TANCRED**, with Godfrey of Bouillon, the soul of the first Crusade, was born in 1078. His father was a Sicilian or Italian marquis named Odo or Ottobonus; his mother was the sister of the celebrated Norman, Robert Guiscard, whose eldest son, Bohemond, was the friend and brother in arms of Tancred. (See **GUISCARD**.) In 1096 the two heroes embarked for Epirus, and thence marched to Macedonia. At the siege of Nicæa (1097) Tancred first appears among the heroes who directed the course of events, and he also took a conspicuous part in the battle of Doryleum (July, 1097). He now advanced, with Godfrey's brother Baldwin, over the Taurus towards Jerusalem. Tancred first penetrated through the passes of the mountains, and obtained possession of Tarsus by capitulation. The perfidious conduct of Baldwin caused a quarrel between him and Tancred, but it terminated in the reconciliation of the chiefs, who now joined the main army which was then marching upon Antioch. On the march to Jerusalem Tancred had command of the advanced guard, and he was the first to storm the walls of the town. During the scenes of horror which attended the capture of Jerusalem (July, 1099) he conducted himself with humanity. The Sultan of Egypt advanced to attempt the recovery of Jerusalem, but was totally defeated by Godfrey of Bouillon and Tancred before Ascalon (August 12). Tancred captured Tiberias, besieged Jaffa, and, after the death of Godfrey, endeavoured to effect the election of

Bohemond as king of Jerusalem; but the unworthy Baldwin obtained the throne. Tancred subsequently conducted the defence of Antioch, and after Bohemond's death in 1111 obtained that principality. He died in 1112, in his thirty-fifth year. He is represented by Tasso in the Jerusalem Delivered as the flower and pattern of chivalry.

**TANGANYIKA**, a large lake of central Africa, extending from  $3^{\circ} 24'$  to  $8^{\circ} 44'$  south latitude, and from  $29^{\circ}$  to  $31^{\circ} 20'$  east longitude. Its long axis lies roughly N.N.W.—S.S.E., but according to the observations of Mr. Moore and Mr. Fergusson in 1899 the westward tendency is greater than that shown on ordinary maps. Its length is about 400 miles, its mean breadth somewhat over 30 miles, its area 13,520 square miles, and its height above sea-level 2700 feet. At the northern extremity it receives the river Rusizi from Lake Kivu, and on the east it receives the waters of the Malagarazi and other streams. The only outlet is the Lukuga on the west, which belongs to the Congo system. It would appear, however, that the lake is not always sufficiently full to give off water by this outlet, the height of its surface varying according to rainfall and evaporation. The lake is bounded on the east by German East Africa, on the west by the Congo Free State, and on the south by Northern Rhodesia. The chief stations on its shore are Ujiji and Usambura, both in German territory. Islands and shallows are very rare. Various aquatic animals inhabit its waters, but the most notable peculiarity of its fauna is the presence of marine mollusca, jelly-fishes, crabs, prawns, and a whole group of similar organisms which are entirely absent from the other lakes (Nyassa, Kivu, Albert-Edward, and Albert Nyanza) of the same rift-valley, and in those (such as Victoria Nyanza) belonging to neighbouring rift-valleys. The facies of the marine mollusca of the lake, moreover, is exactly like that of the fossil mollusca of the Jurassic period, and this fact sheds much light upon the physical history of the great lake region, and leads to the belief that Tanganyika is a sheet of water of immense antiquity. Lake Tanganyika was discovered by Burton and Speke in 1858, and explored by Livingstone and Stanley in 1872. Cameron explored the south end in 1874. Stanley circumnavigated it in 1876, and Hore made a long series of valuable researches in 1878 and the succeeding nine years. Other explorers are Thomson and Gambia in 1879, Giraud in 1884, Baumann in 1891, and Moore and Fergusson in 1899.

**TANGENT**, a straight line of indefinite length, which touches but does not cut a curve; also the length of a straight line which touches a curve measured from the point of tangency to the point where it meets a diameter of the curve; and one of the trigonometrical ratios. A tangent to a curve is the limiting position of a secant. Suppose a straight line as cutting a curve in two points near to one another, and then suppose the line to move so that the points approach each other; at the instant when the points coincide the line is a tangent to the curve. Let  $AB$  be any arc less than  $90^{\circ}$ , draw  $AH$  touching the arc at  $A$ ; from the centre  $C$  draw  $CBH$ , cutting  $AH$  in  $H$ ; the length  $AH$  is the tangent of the arc  $AB$ . It is now considered best to make a distinction between the tangent of an arc and the tangent of an angle. An arc is a curved line of certain length; an angle is not measured by the length of arc, for the measure of a certain angle is so many degrees, whatever may be the length in inches of the circular arc subtending it.



The tangent of an angle is called a trigonometrical ratio, because it is the fraction formed by dividing the number representing the length of one side of a right-angled triangle by that representing the length of the other side. Consider the triangle  $HCA$ , the tangent of the angle  $HCA$  is  $\frac{AH}{CA}$ ; and this fraction

is the same whatever may be the lengths of  $AH$  and  $CA$ . (See TRIGONOMETRY.) A plane is said to be tangent to a curved surface when three points of the plane coincide with three points very close together of the surface.

**TANGENT GALVANOMETER**. See GALVANOMETER.

**TANGERMÜNDE**, a town of Germany, in Prussian Saxony, on the Elbe, 35 miles N.N.E. of Magdeburg. It has remains of ancient walls and gates, an old castle, an old town-hall, a twelfth-century church, &c. Its industries include sugar-refining, ship-building, the manufacture of rapeseed oil and bone-dust, &c. Pop. (1895), 9059.

**TANGHIN** (*Tanghinia venenifera* or *Cerbera Tanghin*), a plant belonging to the natural order Apocynaceae, bearing a fruit the kernel of which, about the size of an almond, is highly poisonous. The plant is a native of Madagascar, and in that island the kernel was formerly used as a test of the guilt or innocence of a suspected criminal. The person undergoing the ordeal was required to swallow, in some form or other, a small portion of the kernel. If he threw it up he was deemed innocent, but if he died, as happened in most cases, he was deemed to have deserved his fate and suffered the punishment of his crime.

**TANGIER**, or **TANJA**, a seaport town of Morocco, near the western entrance of the Strait of Gibraltar, on the south-east of Cape Spartel. It stands on a height near a spacious bay, and presents a very striking appearance when approached from the sea. It is surrounded by walls, and defended by a castle and several forts; but consists mostly of wretched houses, huddled together in narrow dirty lanes. The only exceptions to the general wretchedness of the buildings are furnished by the residences of the European consuls, and those of a few wealthy merchants. The principal building is the castle, occupying a commanding height, but in a very dilapidated state. The total value of the imports, chiefly from Britain, France, Austria, and Germany, in 1901 was £326 997; of the exports, £277,876, chiefly to Spain, Britain, Egypt, France, and the United States. The principal articles of export are eggs, oxen, slippers, wax, woollens, goat-skins, and carpets. The internal traffic is chiefly with Tetuan and Fez. In the time of the Roman Empire Tangier, under the name of Tingis, was the capital of Western Mauretania. It afterwards came into the possession of the Vandals, Byzantines, and Arabs in succession. From the last it was taken by the Portuguese in 1471, and in 1662 was annexed to the English crown as part of the dowry of the Infanta of Portugal. In 1684 it was abandoned by the English on account of the expense necessary to keep it up. Pop. estimated at 30,000.

**TANGLE**, the common name of two species of sea-weed found on the shores of Britain, *Laminaria digitata* and *Laminaria saccharina*. The former has a stalk as thick and as long as a stout walking-stick, and a large flat frond at the summit deeply cleft into numerous thin strips. It is a social species, grows erect in the water, and reminds the spectator of a palm-like tropical forest. The *Laminaria saccharina* has a rounded stalk, rather short, and of the thickness of the finger, a membranous somewhat coriaceous frond of a greenish-red colour, and with marked undulations on the margins. All the members of

this genus contain a saccharine principle, which appears like a floury deposit on the weeds when dried; and it is to the abundance of this principle that this species owes its name. The *Laminaria saccharina* is eaten in many places, and in Japan is considered a delicacy. Among the foreign species of *Laminaria* more or less resembling the tangle of the British shores, the most remarkable are the *Laminaria buccinalis* (the *Ecklonia buccinalis* of Hornemann) belonging to the Cape of Good Hope, and the *Laminaria potatorum* found on the coasts of Australia. The former is much larger than our common tangle, and is furnished with a hollow stem, which the natives convert into a kind of horn, whence it has acquired the name of trumpet-horn. It contains more iodine than any European sea-weed. The *Laminaria potatorum* furnishes an article of food to the Australian aborigines, and the substance of its stem is made into various instruments and vessels.

**TANISTRY**, a mode of tenure that prevailed among various Celtic tribes, according to which the tanist or holder of honours or lands held them only for life, and his successor was fixed by election. The theory by which the electors were guided seems to have been that the worthiest member of the family or stock should always succeed, and other things being equal this seems to have been interpreted so as to give the nearest to the original stock a preferable claim over all the others. Thus a younger brother would be preferred to a son of the last holder, and the son of a younger son to the grandson of the eldest. But in practice this mode of succession frequently led to the election of the one who was deemed the most powerful, and hence was the occasion of numerous feuds.

**TANJORE**; a city in Hindustan, in the presidency of Madras, capital of the district of the same name, in a fertile plain, about 45 miles from the sea, and 170 miles south by west of Madras. It is a station on the Great Southern Railway of India. The fortified town, about 4 miles in circuit, contains the palace of the rajah, numerous pagodas, and irregular streets. Outside of it are other quarters, an English church, the British residency, and a remarkable pagoda, with a tower 200 feet in height, and a sculptured bull, which is one of the triumphs of Hindu art. The best residences at Tanjore are substantially built of brick and lime, and often tastefully decorated. The inferior dwellings and those in the adjacent villages are of mud and tiled or thatched. Manufactures of silk, muslin, and cotton are carried on to a considerable extent. The town was besieged and taken by the British in 1778. It was afterwards restored to the rajah, from one of whose successors it was acquired by treaty in 1799. The German missionary Schwartz died here in February, 1798. Pop. (census of 1901), 57,605.—The district of Tanjore has an area of 3654 square miles, and a population (1891) of 2,228,114. It is very fertile, and is regarded as the granary of the Madras territories. It is for the most part covered with rice-grounds, with coconut groves interspersed. It is noted for its good roads. Hindu institutions still prevail here in great perfection.

**TANK-WORMS**, the name applied generally to a variety of Nematoid (see NEMATHELMIA) Worms found in the water-tanks of India and other tropical countries, and which are interesting to the naturalist from the consideration that they may represent the immature or transitional forms of other Nematodea. Thus the larva or immature form of the Guinea-worm (*Fiaria Medinensis*) is commonly believed to exist in the form of a tank-worm; this latter gaining access to the skin of man, and there developing into the characteristic form of the adult. The perfect or

adults of the Guinea-worms are all females, and it is highly probable that these females are impregnated in early life by the males, which are probably smaller and non-parasitic.

**TANNAHILL**, ROBERT, a very popular writer of Scottish songs, was born in Paisley on the 3d of June, 1774, of parents in humble life. After leaving school he was apprenticed to the weaving trade, and some of his best songs were composed while he was sitting at the loom. After the expiration of his apprenticeship he removed from Paisley to the village of Lochwinnoch, about 9 miles distant, and about 1800 he went to England, where he worked for two years as a weaver at Bolton. He returned to Paisley on hearing that his father was attacked by a dangerous illness, which proved fatal shortly after his arrival. For the rest of his life he resided with his mother at Paisley. Soon after his return from England he became acquainted with the musician R. A. Smith, who set to music and arranged some of his finest songs. His manners were so retiring, and his reliance on himself so small, that without the assurances of friendship he probably would never have been induced to give to the world many of those pieces which have made his name known. In 1807 the first edition of his Poems and Songs was published, and was received very favourably by the public. This, however, did not remove his natural diffidence, which, on the contrary, soon after grew into a deep melancholy. A second edition of his Poems, carefully revised, that he had prepared for the press, was refused by Constable of Edinburgh, and this tended still further to depress him. In a fit of despondency he destroyed all his unpublished songs and the improved versions of those he had already published. In the end he seems to have become a little deranged in his mind, and on the 17th of May, 1810, he put an end to his own life by throwing himself into a pool in which he was drowned. The songs of Tannahill are eminently distinguished by elevation and tenderness of sentiment, richness of rural imagery, and simplicity of diction; his other poems are of no great merit.

**TANNHÄUSER**, or **TANHÄUSER**, the hero of a celebrated German legend. He is represented as a chivalrous knight, who, in the course of his wanderings meets at Mantua with a sage named Hilario, who instructs him in secret lore. At the same city he falls in with a lady called Lisaura, who conceives a violent passion for him, and whose passion he seems at first to have returned. Gradually, however, the tales of his instructor regarding spiritual beings and the ravishing delights of their existence take such a hold of his mind that he comes to desire nothing more than to be allowed to associate with some beautiful spirit in a mortal form. Hilario therefore assures him that he may enjoy Venus herself if he will only have the courage to ascend the Venusberg, a hill near Freiburg, in the interior of which Venus holds her court with dazzling splendour, in the midst of all imaginable delights. Tannhäuser at once resolves to venture on the undertaking, and starts for the haunt of the goddess, on hearing of which Lisaura kills herself in despair. For a long time the knight remains buried in the sensual pleasures of the Venusberg, but at last his conscience touches him, he thinks with regret of the abandoned Lisaura, and listens to the voice of the Virgin Mary, whom he hears calling upon him to return. The goddess allows him to depart, when he hastens first to Mantua to weep over the grave of Lisaura, and then proceeds to Rome to seek from the pope (Pope Urban) absolution for his sins. The pope, however, when he knows the extent of the knight's guilt, declares to him that it is as impossible

for him to obtain the grace of God as it is for the wand which he holds in his hand to bud and bring forth green leaves. Despairing, the knight retires from the presence of the pontiff, and after seeking in vain for Hilario enters the Venusberg once more. Meanwhile the pope's wand has actually begun to sprout, and the pope, taking this as a sign from God that there is still an opportunity of pardon and salvation for the knight, hastily sends messengers into all lands to seek for him. But Tannhäuser is no longer to be found, and never again appears on earth. The preface to the *Heldenbuch*, in speaking of the story of Tannhäuser, adds that the faithful Eckhart, a conspicuous figure in the legendary history of Germany, sat before the Venusberg and warned people of its dangers. Some versions of the legend connect it, not with the Venusberg, but the Heselberg or Hørselberg near Eisenach, where Holle or Holda, who appears to be identical with Freya, is represented as having held her court. The Tannhäuser legend can be traced in its present form as far back as the fourteenth century, and its principal mythological features belong to the time when Germany was still heathen. The modern version of the story is not improbably due to the interweaving of an ancient myth with the fortunes of a real personage named Tannhäuser, a knight and minnesinger of the thirteenth century, who was actually contemporary with a Pope Urban (Urban IV., 1261-65). See Ohlke's *Zu Tannhäuser's Leben und Dichten* (Königsberg, 1890); Schmidt's *Tannhäuser in Sage und Dichtung* (Weimar, 1892); and Baring-Gould's *Popular Myths of the Middle Ages*. The Tannhäuser legend has frequently been subjected to poetical treatment, and Richard Wagner has adopted it (with modifications) as the subject of one of his operas.

**TANNIN**, the name given to a group of chemical compounds obtained from the bark and other parts of plants, and also from certain abnormal growths which occur upon various plants. Certain of these substances form the effective agents in the conversion of skin into leather. The tannins may be divided into two groups: (1) those which are found only in diseased vegetable tissues, such as nut-galls; (2) those which are found in parts of healthy plants. It would appear that the members of the latter group are alone capable of forming, with skin, a true leather which does not putrefy in the air. The tannin which is present to a large extent in nut-galls is called *gallotannic acid*; it may be separated in the form of a colourless amorphous mass, which is soluble in water, forming thereby an exceedingly astringent liquid. Gallotannic or digallic acid has the formula  $C_{14}H_{10}O_8$ ; it forms a series of salts called *gallotannates*. One of the most important of the tannins is *quercitannic acid*, which is found in the bark, wood, and leaves of the oak, and also, apparently, in tea. It is supposed to be present in the oak as a soluble magnesium salt, but this is not absolutely certain. Formerly it was regarded as a glucoside of digallic acid, but this view has now been abandoned, though even yet its composition is a matter of considerable uncertainty. Among the formulæ that have been assigned to it are:  $C_{20}H_{12}O_{11}$ ,  $C_{14}H_{14}O_8$ ,  $C_{17}H_{14}O_8$ ,  $C_{19}H_{16}O_{10}$ ,  $C_{18}H_{16}O_8$ , and  $C_{18}H_{16}O_{10}$ , and it is possible that several substances of somewhat different chemical composition are included under the name. It is described by one investigator as a reddish-white powder, slightly soluble in cold water and readily soluble in dilute alcohol. Tannin forms, with per-salts of iron, a blue-black precipitate; and on heating alone or with dilute mineral acids it forms reddish-brown anhydrides; and it combines with animal gelatin to form a soft, flocculent sub-

stance, which on drying becomes hard and brittle. The combination is not always established in the same proportions, but varies according to the concentration of the solutions and the relative quantities of the substances; nor is the compound in all cases insoluble in water. When the gelatin is only slightly in excess the compound consists of 54 gelatin and 46 tannin; when there is a large excess of gelatin the compound is redissolved. On the formation of this combination the art of tanning depends. The skin of an animal, when freed from the hair, epidermis, and cellular fibre (which is done principally by the action of lime), consists chiefly of indurated gelatin. By immersion in the tan liquor, which is an infusion of bark, the combination of the tannin with the gelatin, which forms the animal fibre, is slowly established; and the compound of tannin and gelatin not being soluble in water, and not liable to putrefaction, the skin is rendered dense and impermeable, and not subject to the change which it would otherwise soon undergo. Tannins, whether the same or modifications of the compound we have just spoken of, occur in the barks of many trees and shrubs; less frequently in annual and biennial plants. Some of the tannins yield blackish-blue precipitates with per-salts of iron, while others produce olive-green compounds under the same circumstances. On this and on other grounds, also, it may be concluded that the class of the tannins includes many distinct chemical compounds; but the relationships which exist between these compounds have not as yet been fully elucidated. See next article.

**TANNING**, the art of converting the skins of animals into leather. The skin of Mammalia consists broadly of two layers, the upper containing colouring matter and the roots of the hair and being cellular in structure, the under being thicker and of fibrous structure. The upper layer is decomposed much more easily than the under by the action of alkalies; the under layer is soluble in water after protracted boiling, yielding a solution which gelatinizes upon cooling. Moist skin undergoes putrefaction when exposed to the air for some time. Dried skin is hard and brittle. In preparing leather the object of the tanner is, in the first place, to remove the upper layer of skin together with all adhering hair, and, in the second place, to bring about such a change in the under layer as shall prevent it from putrefying in moist air, and at the same time render it impervious to moisture, without, however, altering its tenacity and suppleness. The process of tanning, therefore, divides itself into two parts: (1) cleansing the skin and removing the upper layer; (2) converting the under layer into leather. As supplementary to these there is involved the process of dressing and currying the leather.

The skins used by the tanner are principally those of cattle; but the skins of horses, asses, pigs, goats, &c., are also converted into leather. Large supplies of hides—as the skins of the larger cattle are termed—are imported into Britain for tanning. The quality of the hide varies in different animals, and also in the same animal in accordance with the food consumed. Wild cattle are said to furnish hides superior to those of domestic cattle.

The skins, having been thoroughly washed, are steeped in water for some days until they are sufficiently soft to allow of the adhering flesh and muscle being scraped off by means of a blunt knife; this softening process is generally aided by beating the hides with hammers or sticks worked by machinery. The hides are now generally placed in pits, which are filled with milk of lime, whereby the hair and upper layer of skin is gradually loosened; after remaining in the lime-pits for a sufficient time the

hides are again subjected to the action of the dressing knife. Sometimes a slight fermentation—brought about by heat—is substituted for the treatment with lime. The final process preparatory to tanning consists in steeping the hides in a very dilute acid liquid, whereby the lime is entirely removed and the hides are themselves considerably softened and swollen. The prepared hides may now be tanned—that is, rendered impervious to moisture, and enabled to withstand putrefaction without loss of suppleness—by the action of different materials. These materials may be broadly grouped as (1) Tannin, (2) Metallic Salts, (3) Oily Matters. When *tannin* is used the process is always called *tanning*; when *metallic salts* are used the process is called *tawing*; and when *oily matters* are used the name of *shamoing* or *oil-tawing* is applied to the process. We shall briefly describe these processes.

**I. Tanning.**—Tannin is obtained from *oak-bark*, *sumac*, *divi-divi*, *catechu*, and *kino* (see these articles). Thick and heavy hides are usually tanned 'in the bark' as it is termed; thinner hides 'in liquor.' In the former process a layer of spent bark is spread upon the bottom of a wood-lined pit, upon this are piled successive layers of hides and fresh bark, the whole is covered with spent bark, and the pit is filled with water. After eight to ten weeks the hides are removed to a second tank containing less bark, from which, after three to four months, they are again removed to a third tank containing a yet smaller quantity of bark, where they remain for four to five months. If necessary the process is repeated several times. The hides increase in weight from 10 to 12 per cent. during this process. The total quantity of bark required averages six times the weight of the dry hides.

Tanning 'in liquor' consists in placing the hides successively in solutions of tannin of gradually increasing strength. The tannin is thus caused to penetrate the hides completely. The thinner hides must be immersed for six or eight weeks, the thicker for twelve or fourteen weeks in the tanning liquor.

**II. Tawing.**—This process is usually applied to sheep and goats' skins. When the skins have been washed and prepared by being submitted to processes closely resembling those already described they are separately soaked in a tepid bath containing alum and common salt dissolved in water; they are then, without being dried, placed in heaps for a few days, after which they are wrung out and dried slowly by exposure to air. The alum bath for ten skins is usually prepared by dissolving 0.70 kilos. of alum and 0.30 kilos. of common salt in 22.5 litres of boiling water. Aluminium chloride is produced by the mutual action of the salt and alum, and is absorbed largely by the skins; the excess of salt appears also to aid in the conversion of the skins into leather. The tawed and dried skins are softened by being damped and stretched between a curved iron and a movable steel plate, after which they are again dried. Heavy hides are sometimes tawed for the use of the saddler by steeping them in a bath containing a larger quantity of alum and salt than that mentioned above, drying them, and then rubbing them with tallow before a charcoal fire. A very strong leather may thus be prepared in a comparatively short time. The more delicate kinds of leather—especially that for making kid gloves, kid shoes, &c.—are tawed by immersion in a bath containing alum, salt, yolk of eggs, wheaten flour, and water. The oil contained in the egg yolks confers upon the leather a great degree of softness, the gluten of the flour seem to aid the skin in the absorption of aluminium chloride. The skins are stretched by hand and rapidly dried in the open air; they are then damped, placed between linen

cloths, and trodden upon until they become soft. They are finally polished by rubbing with a glass disc smeared with white of egg or solution of gum, &c.

**III. Oil-tawing.**—So called *wash leather* or *chamois leather* is prepared from the skins of deer, sheep, calves, &c., by tawing them with oil.

The skins having been washed, limed, &c., in the ordinary way, are repeatedly rubbed with animal oil, exposed to the beaters of a fulling machine, and dried. The oil employed is usually a fish oil; a small quantity of carbolic acid is sometimes added. The skins are stretched and sprinkled with oil, which is gently rubbed in with the hand; they are then placed in bundles in the fulling machine and exposed to the action of the beaters for several hours. After exposure to the air the skins are again rubbed with oil and again placed under the beaters; these processes are repeated until the fleshy odour of the original skin is no longer perceptible. By exposure to a warm atmosphere a process of gentle fermentation is originated within the skins, whereby the pores are dilated and the oil is enabled to penetrate the mass more thoroughly. The excess of oil is finally removed by washing with a dilute warm caustic ley; the skins are then dried and dressed. Wash-leather is much used for making military belts, gloves, socks, &c., for surgical applications, for cleaning glass and porcelain, and for polishing jewelry.

The choice of the vegetable products to be used for tanning depends partly on price and partly on the specific qualities of the various agents. The number of those in common use is large and the supply is very abundant. Oak-bark, mostly cut from coppice wood, is the most valuable material of domestic growth. Sumach; mimosa; valonia, the acorn cup of the *Quercus agrifolia*, an oak grown in the Levant; catechu; divi-divi, a South American plant; nut-galls; myrobalans, the fruit of several East Indian trees; gambier; and many other home and foreign vegetables, yield a marketable supply of tannin. It is impossible to estimate the quantity used of home material, and the various foreign substances imported are used for dyes and other purposes as well as in the tannery. The import of them into Britain may, however, give some idea of the extent of the trade from which the principal demand for them arises.

#### The import of—

Valonia in 1901	amounted to 80,533 tons,	value £324,082
Cutch and Gambier	17,613 „ „	891,773
Myrobalans	24,102 „ „	145,980
Sumach	11,258 „ „	105,755
Bark	22,073 „ „	172,599

besides other imports. Oak-bark produces leather of a light fawn colour; valonia gives a grayish tint, and makes the leather heavy, solid, and especially impervious to water; catechu or terra japonica gives a rich dark fawn colour, with a somewhat spongy, porous, and pervious texture. Bark is commonly used ground to powder in a mill.

The manner in which tanning is conducted in different establishments varies much in detail, though the general principles are the same. Instead of that uniformity in the commoner processes which might be expected from accurate knowledge, each tanner has his secret as to the best process for bringing about the chemical transformation which it is their common object to effect; and these secret methods, the value of which as the result of a limited experience is inevitably overestimated by those whose knowledge is confined to that experience, prevent comparison and the rejection of superfluous and injurious operations. The trade of tanning may, however, be said to be still in its infancy. It was only at the end of the 18th century that scientific methods began to be applied to leather making, and although not much

progress has hitherto been made, considerable activity has been shown in the pursuit of improvement.

The extreme slowness of the process of leather making by any of the ordinary processes of tanning has afforded a strong motive for inquiry as to the possibility of hastening it by additional contrivances. Many patents have been taken out, but none appears yet to have given satisfaction to the trade by solving the problem how thick leather can be thoroughly tanned within a limited time. We shall not in these circumstances attempt any detailed description of the various processes adopted. They may, however, be briefly described by a general classification as consisting of three kinds. The first evades the problem by dressing hides by some other method than tanning. This plan is commonly adopted with thin skins, but has not been found to make good leather with hides. Metallic solutions, such as copperas and black oxide of manganese, have been tried with hides as a substitute for the vegetable tan-liquor. The second plan is to facilitate the absorption of the tan by auxiliary mechanical processes. Alternate squeezing and soaking, rotatory pressing with cylinders, and other methods have been tried, but none has yet given entirely satisfactory results. The third, and perhaps the most hopeful plan, is to prepare the hide by some chemical agent for the readier reception of the tan. A solution of chloride of sodium and ammonium is used in one patent for this purpose.

The quantity of hides and skins tanned in Great Britain cannot be ascertained. The import of foreign hides and leather into Britain in 1901 is subjoined. Raw and undressed hides chiefly come from the British East Indies, United States, Belgium, Italy, Germany, France, Australia, and Holland.

Dry hides .....	353,087 cwt.,	value	£207,132
Wet hides .....	757,175 "	"	1,782,779
Tanned hides, undressed ..	903,131 "	"	4,558,068
Tawed, curried, &c. ....	412,878 "	"	3,625,305
Varnished, japanned, or enamelled .....	7,824 "	"	228,304

The chief seats of the tanning trade of Great Britain are Bermondsey (London) and Leeds.

Before leather is ready for the market it is subjected to a process of currying. See CURRYING.

TANREC, or TENREC (*Centetes*), a genus of Insectivorous Mammals, distinguished by the elongated muzzle and the short rounded ears. The body is covered on the upper surface with spines and bristles; no tail exists. These animals inhabit Madagascar, the most familiar species being the *Centetes caudatus*, whilst other species are the Tendirac or Spiny Tanrec (*C. spinosus*) and the Banded Tanrec (*C. Madagascariensis*). The *C. caudatus* is an animal of about the size of the European hedgehog, but with a larger body, the legs being also more elongated. The quills or spines are yellowish at their bases, and black towards their tips. They average about 1 inch in length. These animals hibernate like the European hedgehog, and live in burrows, which they excavate by means of their strong claws. They do not, however, possess the power of rolling themselves up into a ball-like form for defence. The food consists of worms, insects, reptiles, &c. All the three species are eaten by the natives of Madagascar.

TANSY (*Tanacetum vulgare*), a plant belonging to the natural order Compositæ, and growing by roadsides and in waste places. The stems are upright, branching, and about 2 feet high; the leaves doubly pinnate and incisely serrate, and of an agreeable aspect. The flowers are yellow buttons, disposed in a large, upright corymb. The whole plant has a strong and penetrating odour, agreeable to some persons, and an extremely bitter taste. It contains an acrid volatile oil, is stimulant and carminative,

and the decoction and seeds are recommended as anthelmintic and sudorific. The young leaves are shredded down and employed to give colour and flavour to puddings; they are also used in omelets and cakes, and those of the curled variety for garnishing.

TANTALUM, a rare element found in a few minerals. Tantalum has been obtained in the form of a black powder, which, after fusion in hydrogen, has a specific gravity of 10.78. It is oxidized by heating in the air. Hydrochloric, sulphuric, nitric, and nitromuriatic acids are without action upon tantalum, but it is dissolved by hydrofluoric acid. Tantalum has the symbol  $Ta$ , and the atomic weight 183. It forms a series of salts in which it appears to be pentavalent.

TANTALUS, son of Zeus, and king of Sipylus, in Phrygia, or according to other accounts of Lydia, Argos, or Corinth, was a favourite of the gods, who often visited him, until he forfeited their favour by his arrogance. Tradition does not agree as to his crime. According to one account he offended Zeus by his perfidy; according to another he stole away the nectar and ambrosia from heaven; and a third story is that he murdered his own son Pelops, and served him up for some of the gods. The same diversity prevails in regard to his punishment. The most common account represents him as standing up to his throat in water, with the most delicious fruits hanging over his head, which, when he attempts to quench his burning thirst or to appease his raging hunger, elude his grasp. He has also a great rock suspended over his head, which constantly threatens to fall and crush him. From this fable comes the English expression to *tantalize*.

TAPAJOS, a river of Brazil, formed by the confluence of the Arinos and Juruena, on the north frontiers of the province of Matto-Grosso; lat.  $9^{\circ} 30' S$ . The united stream, taking the name of Tapajos, enters the province of Para, flows N.N.E. at first in a narrow stream hemmed in by mountains, but afterwards in a broad and deep channel, receives the Preto and several important tributaries almost all on the right, and finally, at Santarem, enters the Amazon on the right, of which it is one of the main tributaries. Its navigation is impeded only by two cataracts, and though it is not so deep as the Madeira it contains much fewer obstructions, and furnishes both a shorter and an easier channel for several of the towns of the interior.

TAPESTRY, a kind of woven hangings consisting of a groundwork or warp of hemp or flax interwoven with coloured threads of wool, silk, and sometimes gold and silver, these coloured threads forming representations of men, animals, landscapes, historical subjects, &c. The designs may either be worked in with the needle, or woven in by the loom. In the middle ages the working of tapestries with the needle was a common occupation of ladies. This species of curtain-covering for walls was known among the inhabitants of eastern countries at an extremely remote period. The most grotesque compositions and fantastic combinations were commonly selected for the display of the talents of workmen in this department of oriental art, which was afterwards imported into Greece. At length the refined taste of Athens became visible in the structure of tapestries. The old grotesque combinations no longer, as formerly, covered their surfaces, but were confined to the borders only; and the centre received more regular and systematic representations. The loom was introduced into France in the ninth century. In modern times this description of embroidery has been executed with very great success, and has often employed the talents of the greatest masters in the



art of painting. In Flanders, particularly at Arras (whence the term *arras*, signifying 'tapestry'), during the fifteenth and sixteenth centuries, the art was practised with uncommon skill; and tapestries were executed there after the masterly designs of Raffaele in his cartoons. (See CARTOON.) The making of tapestry was early practised in England with great skill. A celebrated tapestry, the Bayeux Tapestry (which see), gives a representation of the Norman conquest of England. The art of weaving tapestry was introduced into England near the end of Henry VIII.'s reign. In 1619 a manufacture was established at Mortlake, in Surrey, by Sir Fras. Crane, who received £2000 from James I. to encourage the design. The first manufacture of tapestry at Paris was set up under Henry IV., in 1606 or 1607, by several artists whom that monarch invited from Flanders. But the most celebrated of all the European tapestry manufactures was that of the Gobelins, instituted under Louis XIV., which sends forth very beautiful tapestries, remarkable for strength, for elegance of design, and happy choice of colours. (See GOBELIN MANUFACTORY.) The texture of tapestry is in many respects similar to that of the finer carpetings; but the minuteness of the workmanship conceals the texture from the eye, as the individual colours in painting are lost in the general effect of the pictorial design.

TAPE-WORM, the name given to various genera of Cestodea, or Flat-worms (Platyhelminths), from their flattened, ribbon-like shape, but usually restricted to the species of the genus *Tenia*, of which the *T. solium* or Common Tape-worm (Pl. I. at art. MOLLUSCA, fig. 14), inhabiting the human intestines, is the familiar and typical example. Taking the Common Tape-worm as a typical example of this group of animals, we find it to consist, in its mature condition (*strobila*, figs. 10, 22), of a 'jointed' organism which may attain a length of from 10 to 80 feet or more, and an average breadth of  $\frac{1}{4}$  inch. The head (figs. 13, 15, 22) of such an organism attains the size of a pin's head, and is of globular shape, having a proboscis or rostellum armed with a double-crown of hooks (figs. 7, b, c, d, and 18 a), numbering from twenty-two to twenty-eight in each row, whilst the head also possesses four suckers (figs. 13, 15), by means of which, together with the hooks, it adheres to the mucous or lining membrane of the intestine. Sometimes instead of discs there are two or four sucking cavities (fig. 17 a). The head is prolonged backwards into a thin 'neck' (fig. 22), whilst to the neck succeeds the front portion of the body, consisting of immature or newer segments. Behind these latter we find the mature segments or 'joints,' each named a *proglottis* (figs. 14, 16), and in a worm 10 feet long about 800 joints may be contained. New segments or joints are intercalated, by budding from the neck, between the mature segments and the neck. The perfectly formed joints are thin and transparent, and are twice as long as they are broad. When examined as to its structure, each joint is seen to contain both male and female generative organs, the ovary containing the eggs existing as a branched tubular organ (figs. 14, 16) occupying the greater part of the interior of the segment, whilst the male organs exist in the form of small vesicles or sacs. Fig. 11 shows an ovum—*a*, *b*, *c*, being three successive envelopes with the embryo *d* in the centre. The generative pore, or opening through which the generative elements escape, varies in position in different genera. In the *T. solium* it exists in the centre of one of the sides or margins of each segment, and in *Bothrioccephalus* (fig. 18) in the flat surfaces of the joints. The nervous system exists in the form of two small ganglia, which exist in the head, and send filaments backwards. The water-

vascular system consists of two tubes, one of which runs down each side of the segments, and which communicates with its fellow-vessel of the opposite side by a cross branch at the hinder margin of each joint. In the article PARASITES we have already described the different stages through which the tape-worm passes in the course of its development. It is there shown that the 'measles' of beef and pork are the result of the presence of tape-worm scolices, or larvae (figs. 5, 6, 8, 9, 12, 19, 20), which, unless killed in cooking, give rise to perfect tape-worms in man. Fig. 6 shows a measele or scolex, the immature worm, in the centre (*b*); fig. 5 shows the worm partly escaped from the vesicle *a*, *d* being the head and *c* the neck. Fig. 12 shows a tape-worm further developed (much magnified), *a* being the crown of hooks, *b* sucking disc, *c* the point at which the head portion will afterwards separate from the neck *d* and the vesicle *e*. In figs. 8 and 9 are exhibited a scolex from the lung cavity of the common black snail. The vesicle in this case surrounds the scolex like a double sac, *a* being the outer and *b* the inner membrane, *c* sucking disc, *d* proboscis sheath, *e* neck, *f* six cast-off embryo hooks, attached to the sac, *g* proboscis with its crown of hooks. The letters in fig. 9 have the same references, the worm having now escaped from the sac, which is seen as a cylindrical appendage. The importance of subjecting animal food to a high rate of temperature, or in other words of thoroughly cooking it, can well be estimated, from the prevalence of these parasites in countries where much raw or imperfectly cooked meat is eaten. It is also a well-known fact that different species of these parasites affect different nations. Thus one genus and species, the Swiss Tape-worm (*Bothrioccephalus latus*, figs. 16, 17, 18) is confined to Europe, and is found chiefly in the inhabitants of West Switzerland and North-west Russia, and of Poland and Sweden. The intermediate or primary 'host' of this latter form has not as yet been determined with accuracy. The remedies most to be relied on for the expulsion of *Tenia* from man are the root or rhizome of the male shield-fern (*Lasium filix-mas*), oil of turpentine, and santonin (*Artemisia santonica*); and it is important to note that the efforts of the treatment must invariably be directed towards the expulsion of the head of the worm, since if the minute head and neck segments be left attached to the bowel they are, as already remarked, competent to reproduce a new worm by budding. See PARASITES.

TAPIOCA. See MANIO.

TAPIR (*Tapirus*), a genus of Ungulate (which see) or Hoofed mammals, belonging to the section Perissodactyla (which see) of that order, and distinguished as a family (Tapiridae) by the fact that the nose is prolonged to form a short proboscis or trunk, the skull being of pyramidal form, and thus resembling that of the Swine (Suide), from which, however, the Tapirs are quite distinctly separated. A short tail exists, the skin being covered with short, thick hairs. The front feet have each four toes, the hind feet possessing three toes only. The little toes of the front feet are unsymmetrical, and do not touch the ground, whilst all the toes are 'hoofed.' The incisor teeth number six on each jaw; the canines are very small; fourteen molars are developed in the upper and twelve in the lower jaw. The Tapirs possess a very wide distribution, and inhabit both the Old and New World. The best-known species is the South American Tapir (*T. Americanus*, shown on Plate I. at UNGULATA), which inhabits tropical America, and is chiefly found inhabiting the banks of rivers, in which it swims and dives with great ease. It is chiefly a nocturnal animal, feeding on roots, fruits, and leaves. The adult is coloured brown, the young being variegated with

lighter spots and stripes on a darker ground. The neck possesses a short black mane. The average length is from 4 to 6 feet. A second species of South American Tapir is the *T. villosus* (or *Roulini*), which is distinguished chiefly by the greater length of its hair. This latter form inhabits the elevated parts of the Andes. The only other distinct species is the Malayan Tapir (*T. Malayanus* or *Indicus*), found in Malacca and Sumatra, and known by the white colour of the hinder part of its body, the head and anterior portions being black. The proboscis is larger in the Malayan species than in the South American forms, and the former has no mane. It is usually of larger size than the New World forms, and appears to be a shy, retiring animal, inhabiting clumps of brushwood.

**TAPPING**, or **PARACENTESIS**, a surgical operation by which an opening is made into the abdominal or other cavity of the body, for the removal of fluid. This operation is performed most commonly in abdominal dropsy, and for the removal of fluid from ovarian tumours; also for the removal of fluid effused into the pleural cavity in pleurisy.

**TAPROBANE**, the ancient name of Ceylon. See **Ceylon**.

**TAPTI**, or **TAPTEE**, a river in Hindustan, rises in the Narbada division (Betul district) of the Central Provinces, flows nearly due west across the plains of Khandesh and Gujerat in Bombay, and after a course of about 460 miles falls by several mouths into the Gulf of Cambay, 20 miles below Surat and 30 miles south of the mouth of the Narbada.

**TAR**, a thick dark-coloured liquid produced by the destructive distillation of organic bodies and bituminous minerals. Tar is usually obtained from wood, coal, or carbonaceous minerals such as shale, peat, or lignite. Wood-tar has an acid reaction, and contains various liquid matters, of which the principal are methylacetate, acetone, hydrocarbons of the benzene series, and a number of oxidized compounds including carbolic acid. Paraffin, anthracene, naphthalene, &c., are found among the solid products from wood-tar.

Wood-tar is chiefly prepared in Russia and Sweden by a very rude process of distillation, the wood of coniferous trees being mostly employed, including roots, stumps, &c. A conical cavity is made in the ground, on a sloping bank or hillside, with a cast-iron pan at bottom, from which leads a funnel. The billets of wood are piled up in and above this cavity, and, being covered with turf, are slowly burned without flame. The tar which exudes during combustion is conducted off through the funnel. Regular kilns or retorts are also employed, being much more economical. In Great Britain wood-tar is obtained as a by-product in the preparation of vinegar from wood (pyroligneous acid). On account of its antiseptic properties wood-tar is largely used for the preservation of wood. The amount of tar imported into Britain in 1901 was 350,928 cwts., valued at £92,730. It came chiefly from Russia, the United States, and Germany.

Tar is a stimulant to the skin and the mucous membranes. It is used externally in skin diseases in the form of ointment or oil; for internal use it is prepared as pills or tar-water. Tar may also be used as a soap, and the inhalation of the vapour is of value in bronchitis and other similar affections.

Coal-tar may be separated by distillation into light oils, heavy oils, and pitch; from the former naphtha and benzole are obtained (see **NAPHTHA**), while from the heavy or 'dead' oils aniline and allied bases, and a large number of hydrocarbons, naphthalene, anthracene, &c., may be separated. Coal-tar collects in large quantity in the condensers of the gas manufacturer. It is a valuable substance, inas-

much as the compounds obtained from it form the starting-points in many chemical manufactures. See under the article **DISTILLATION**, also **FITCH**, **ANTILINE**, **MADDER**, **PARAFFIN**.

**TARA**, or **TARO** (*Colocasia macrorrhiza*), a plant of the natural order **Araceae** (arums), cultivated as an esculent in the Polynesian Islands. The foliage and roots are highly pungent and acrid, but when washed and cooked the roots become mild and palatable, with a flavour similar to that of bread. The leaves, which spring direct from the root, are broad and heart-shaped. The flowers grow in a spathe.

**TARA FERN** (*Pteris caudata*), a species of fern growing in New Zealand, a kind of bracken, the root of which is used as food by the natives. It is baked in the ashes, and eaten after the skin is stripped off.

**TARANAKI** (formerly *New Plymouth*), a provincial district of New Zealand, on the west coast of North Island, having the provincial district of Auckland on the north and east, Wellington on the east, and the Pacific Ocean on the south and west. Its coast-line extends to 130 miles, the northern part being slightly concave, while the southern part projects into the ocean in an almost semicircular curve. New Plymouth, the capital, is near the northern extremity of the semicircular projection. The coast is almost without indentations, and has no good natural harbours. The area is 3339 square miles. Nearly three-fourths of it is dense forest. Fern and flax occupy the uncultivated parts of the remainder. The Mokau River separates Taranaki from Auckland on the north; and the province is watered by other streams. There is a good coal-field on the Mokau, where limestone and fine brick-making and pottery clay are also found. The titaniferous iron-sand of the sea-beach is the purest iron ore known. The soil is excellent, and vegetation luxuriant. The district is well adapted both for agriculture and cattle-feeding. Mount Egmont, in the south-west, attains a height of 8270 feet. Pop. in 1891, 22,065; in 1901 37,855.

**TARANTO** (Latin, *Tarentum*; Greek, *Taras*), a city of Southern Italy, in the province of Lecce, situated at the northern angle of the Gulf of Taranto, on a rocky tongue of land which separates the ancient inner harbour, a sort of lagoon called the *Mare Piccolo* (Little Sea), on the east, from the open sea (Great Sea) on the west. The site has been made an island by a canal on the south-east, crossed by an iron swing-bridge, which admits the largest war-vessels; another bridge at the north-west end also connects it with the mainland. Two islands, S. Paolo, with a fort and a lighthouse, and S. Pietro, guard the entrance to the outer harbour. The streets are very narrow, the three principal being the *Strada Garibaldi* along the *Mare Piccolo*, inhabited chiefly by fishermen; the *Strada Maggiore*, in the heart of the town, the main business thoroughfare; and the *Strada Vittorio Emanuele*, along the sea-front, a fine promenade. The eleventh-century cathedral, now wholly modernized, and the old castle, are the chief objects of interest in the town proper. The Borgo Nuovo, a suburb on the mainland to the south-east, occupying the site of ancient Tarentum, contains a large arsenal and naval hospital, and various harbour works have been constructed. The fortifications of the town have been much strengthened since 1895. There is an export trade in oil, wine, liquorice, fruit, &c.; and coals, grain, petroleum, &c., are imported. Tarentum was founded by Greeks in B.C. 707, and rapidly became the chief city of *Magna Græcia*. It was noted for weaving, and for the purple dye obtained from a species of mussel. It reached its greatest prosperity under Archytas, the philosopher, in the fourth century B.C., after which



luxury and vice caused it to decline. It was compelled to seek the assistance of Greek kings in its wars with the Lucanians, and when attacked by the Romans it was assisted by Pyrrhus of Epirus. In B.C. 272, however, it was taken by the Romans, and the conquest was repeated in 209, after the city had supported Hannibal in the second Punic war. It passed later under Byzantine sway, was destroyed by the Saracens in 927 A.D., and later belonged to the Norman kingdom in south Italy. In 1861 it became included in the kingdom of Italy. A consular report for 1901 gives the pop. as nearly 65,000.

**TARARE** (ancient *Taratrum*), a town of France, in the department of the Rhone, 20 miles north-west of Lyons. Its prosperity is of very recent date, and is owing to the successful introduction of the manufacture of fine muslins. The other manufactures are silk goods and merinoes. The town is elegantly built. Pop. (1896), 11,186.

**TARASCON** (ancient *Tarasco*), a town of France, in the department of Bouches-du-Rhone, advantageously situated on the left bank of the Rhone, opposite Beaucaire, with which it communicates by a suspension-bridge, 50 miles N.N.W. of Marseilles. It is surrounded by walls, flanked with towers, and entered by three gates. The streets are wide and regular, and one of them is lined with arcades. The principal buildings are the old castle, seated on a height overhanging the river; the church, a handsome Gothic structure of the eleventh century, with a finely-sculptured portal; the townhouse, courthouse, theatre, general hospital, and public library. The manufactures consist of woollen cloth, serge, silk goods, hempen and cotton cloth, vermicelli, soap, starch, and cordage. There are also brandy distilleries, wax refineries, tanneries, brick-works, and building-yards for barges. The trade is in wine, brandy, oil, hemp, wool, wood, coal, medicinal plants, lucerne-seed, and madder. Pop. (1896), 5400.

**TARAXACIN**, a bitter, crystallizable principle contained in the milky juice of the dandelion, especially in the juice of the roots. It possesses tonic, aperient, and diuretic properties.

**TARAZONA**, an episcopal city of Spain, in the province of Saragossa, 57 miles W.N.W. of the town of Saragossa, on the Queiles, here crossed by several bridges. The city proper forms a kind of amphitheatre, its streets resembling an irregular stair, the whole producing a fine effect. There is here a very ancient episcopal palace, once the residence of the kings of Arragon. The cathedral, founded about the thirteenth century, is externally a tasteless medley of Byzantine and Gothic architecture, but the interior is very grand and imposing. It has some manufactures, but the inhabitants are chiefly engaged in agriculture and cattle-rearing. Here were celebrated in 1170 the nuptials of Alonzo VIII. of Castile, with Leonora, daughter of Henry II. of England. Pop. (1887), 8520.

**TARBES**, a town of France, capital of the department of Hautes Pyrénées, beautifully situated, 110 miles south of Bordeaux, on the left bank of the Adour, here crossed by a handsome bridge. Its principal edifices are the cathedral, a modern structure, erected on the site of the old castle of the counts of Bigorre, of whose territory Tarbes was the capital; the church of St. John, the church of the Carmelites, with a remarkable spire; the prefecture, occupying the old episcopal palace; the civil hospital, college, and barracks. The manufactures consist of leather and paper; and the trade includes, in addition to these articles, wine, iron, cattle, and agricultural produce. Tarbes is mentioned by Cæsar under the name of Bigorra. Pop. (1896), 24,197.

**TARDIGRADA**, an order of Arachnida (which

see), represented by the 'Sloth' or 'Bear' animalcules, and sometimes also known by the names Macrobiotidae and Arctisca. These animalcules are microscopic in size, and are found in the refuse of gutters and other damp situations. They resemble the Rotifera (which see) closely. The abdomen is undeveloped. Four pairs of rudimentary legs exist; and the mouth is suctorial in its character. No circulatory or breathing organs are developed, and the sexes are united in the same individual. See the plate at CRUSTACEA.

**TARE**, in botany. See **VERTICE**.

**TARE**, in commercial technology, is an allowance for the outside packages of goods which cannot be unpacked without detriment, or for the papers, threads, bands, &c., that inclose or bind any goods imported loose, or which, though imported in casks, chests, &c., yet cannot be unpacked and weighed net.

**TARENTULA**. See **SPIDER**.

**TARENTUM**. See **TARANTO**.

**TARGUMS** are Aramaic Versions of the Old Testament. The origin and date of these versions is a question of much difficulty on which scholars are not agreed. One theory is that the Jews lost the use of the Hebrew tongue during the Jewish captivity, and on their return the priests or scribes, in reading the law to the people, had to add oral translations. This is held to be the explanation of Neh. viii. 8. Rules were subsequently laid down by the Mishna for the oral interpretation of the Bible, and to secure conformity with these rules the interpretations were written out. Others hold that the use of Hebrew was not lost during the captivity, but died out gradually after the return. The Aramaic or Chaldean versions being originally the result of oral interpretations in the synagogues, the date of them cannot be fixed with any certainty. There are eleven written targums or versions of various parts of Scripture. The Targum of Onkelos contains the Pentateuch alone. Its date has been variously fixed at from the second to the third or fourth century A.D., the latest date being that assigned for the final redaction of the version, part of the text of which may have been a century older. The name of Onkelos has been plausibly identified with that of Akilas, the author of a Greek version of the Old Testament in the time of Hadrian, but who is not supposed to have had anything to do with the Targum. The version is generally literal except in avoiding anthropomorphic expressions relating to the deity, and in occasionally interpreting figures of speech. This literal rendering of the text, however, is accompanied by paraphrastic expressions explanatory or illustrative of the text. These take frequently the form of Hagadistic stories. (See **TALMUD**.) The Targum known as that of Jonathan ben Uzziel contains Joshua, Judges, Samuel, Kings, the three greater and twelve minor prophets. Jonathan ben Uzziel was a disciple of the Rabbi Hillel the Elder, but the Targum is erroneously ascribed to him. The Talmud assigns it correctly to Joseph, a Babylonian rabbi of the first half of the fourth century. Joseph was probably, however, only the redactor or editor of this Targum. There is a complete Targum on the Pentateuch under the name of Jonathan, and another fragmentary one called the Targum Jerushalmi. The last of these is supposed to consist of a collection of corrections or variations of Onkelos, and the first of a complete Targum constructed on the basis of these variations. It is estimated to belong to the second half of the seventh century. The other Targums, which we shall merely enumerate, are a Targum on Psalms, Job, and Proverbs, and a Targum on the five Megilloth, Song of Songs, Ruth, Lamentations, Esther, and Ecclesiastes, ascribed to Joseph the Blind; two Tar-

gums of Esther, a Targum of Chronicles, a Targum of Daniel, a Targum of the apocryphal parts of Esther. All these are much more recent than the Targums referred to.

**TARIFA**, a maritime town of Spain, in Andalusia, 52 miles south-east of Cadix, and 16 miles west by south of Europa Point, thus forming the most southerly point of Europe. It is surrounded by fortifications built by the Moors, and contains a very ancient Moorish castle; but the real strength of the place lies in the rocky peninsula, 700 by 600 yards, which projects into the sea, and has a fortress and a lighthouse, 135 feet high, visible for 30 miles. Tarifa has some manufactures, and a limited shipping trade. It derives its name from Tarif Ibn Malik, who landed here when sent by Muza, the Mussulman emir, to reconnoitre before the invasion from Africa. In 1811 it was successfully defended by Colonel (afterwards Lord) Gough against a superior French force. Pop. (1887), 13,206.

**TARIFF**, or **TARIF**; first, a list of certain merchandises, of which the price was fixed by government; then a list of duties on imports and exports. This word, like many others used in commerce, is derived from the Italian, in which it is *tariffa*; this again comes, like several other expressions relating to commerce or navigation, from the East. In Persian it is *tarif*. In Arabian the verb *arf* signifies 'to know,' which in the second form becomes *tarif*, signifying 'to make known.' The substantive derived from the verb therefore signifies notification.

**TARLATAN**, a thin and fine species of muslin, mostly used for ladies' ball dress. The chief seat of the manufacture is Tarare, in France.

**TARN** (anciently *Tarnis*), a river of France, which rises on the south slope of Mount Lozère, near Florac, in the department of Lozère; flows w.s.w., crosses the departments of Aveyron and Tarn, passing Alby, turns north-west through Haute-Garonne into Tarn-et-Garonne, where it passes Montauban, and shortly after, turning almost due west, passes Moissac, and joins the Garonne on the right about 3 miles below. Its whole course is 230 miles, of which about 100 miles, beginning at Alby, are navigable.

**TARN**, a department of France, bounded on the north and north-east by the department of Aveyron, south-east by Hérault, south by Aude, south-west by Haute-Garonne, and north-west by Tarn-et-Garonne; area, 2218 square miles. The surface is intersected by hills, which generally terminate in flat summits, on which, as well as their sides, cultivation is successfully carried on. Between the hills are several fertile and extensive plains, producing in abundance all the ordinary cereals. A considerable part of the surface is also occupied by vineyards. The minerals include iron and coal, both of which are partially worked. Woollens, linens, hosiery, casks, liquors, and confectionery are manufactured. The trade is chiefly in agricultural produce. Tarn is divided into four arrondissements—Alby (the capital), Castres, Gaillac, and Lavaur; subdivided into 36 cantons. Pop. (1896), 334,372; (1901), 326,396.

**TARN-ET-GARONNE**, a department of France, bounded on the north by the department of Lot, east by Aveyron and Tarn, south by Haute-Garonne, and west by Gers and Lot-et-Garonne; area, 1537 square miles. The surface is generally flat, but somewhat undulating, and has a gradual slope to the west. It attains its greatest height in the south and east, where there is a range of hills, in which several streams take their rise. The whole department belongs to the basin of the Garonne, which traverses it south to north-west, and receives within it the accumulated waters of the Tarn and Aveyron, which are both navigable. The arable land raises heavy

crops of wheat, maize, hemp, and tobacco. Excellent wine is also produced. Fruit of all kinds abounds, and the mulberry is extensively cultivated for the rearing of silk-worms. The most important manufactures consist of common woollen cloth and serge, linens, goods, silk hosiery, cutlery, quills, starch, leather, soap, paper, and earthenware. The trade is extensive. The department is divided into three arrondissements—Montauban (the capital), Castel-Sarrasin, and Moissac; subdivided into 24 cantons and 194 communes. Pop. (1901), 194,458.

**TARNOPOŁ**, a town of Austria, in Galicia, on the left bank of the Sereth, 70 miles s.e. of Lemberg. It contains a Roman Catholic and a Greek Catholic church, an old castle, now used as barracks, a new castle, Jesuit college, a gymnasium, a Polish real-school, several other schools, manufactures of wax, honey, &c., and a trade in horses, grain, &c. Pop. (1900), 30,368.

**TARNOW**, a town of Austria, in Galicia, on a height above the right bank of the Biala, here crossed by a covered wooden bridge, 48 miles s.e. of Cracow. It is for the most part well built, is the see of a bishop, has a handsome cathedral, gymnasium and other schools, a theological seminary, and manufactures of agricultural implements, glass, chicory, &c. Pop. (1900), 31,548.

**TARPAULIN**, a broad piece of canvas, well daubed with tar, and used to cover the hatchways of a ship at sea, to prevent the penetration of the rain or sea-water which may at times rush over the decks.

**TARPEIAN ROCK**, a portion of the capitol at Rome, which is said to have received its name from the following legend:—In very early times, during a war with the Sabines, Tarpeia, the daughter of Tarpeius, the governor of the citadel of Rome, promised to open the gates of the city to the Sabines, provided they gave her their gold bracelets, or, as she expressed it, what they carried on their left hands. The Sabines consented, and as they entered the gates threw not their bracelets but their shields upon Tarpeia, who was crushed under the weight. She was buried in the capitol, which from her was called the Tarpeian Rock; and there Roman malefactors were afterwards thrown down a deep precipice.

**TARQUINIUS**, **LUCIUS**, surnamed *Priscus*, in legendary history the fifth king of Rome. The family of Tarquinius was of Greek extraction, his father Demaratus being a Corinthian, who, owing to a political revolution, crossed to Italy, and settled in Tarquinii, one of the chief cities of Etruria. He is said to have introduced among the Etruscans the knowledge of the alphabet. He had two sons, Lucumo and Aruns, by an Etruscan wife. Lucumo inherited all his father's property. He had married a Tuscan lady of high rank named Tanaquil, but on account of his foreign extraction he was excluded from public employment. Prompted by his own and his wife's ambition he removed with a large following to Rome, where he was received with welcome, and admitted, together with his followers, to the rights of Roman citizenship. He took the name of Lucius Tarquinius. The surname *Priscus*, the elder, given him by Livy, may be considered as a historical distinction, though the same surname existed in several Roman families. Tarquinius became the favourite and confidant of the King of Rome, Ancus Martius, who appointed him the guardian of his children. On the death of Ancus, Tarquinius was unanimously elected as his successor. According to Livy he made war with success on the Latins and Sabines, from whom he took numerous towns. Dionysius relates that five Etruscan cities sent

assistance to the Latins during their war with Tarquinius, and the twelve confederate cities subsequently united against Rome, and were defeated by Tarquin, who received from them various insignia of royalty, as a golden crown, an ivory throne, a sceptre, a toga, &c. Tarquinius also distinguished his reign by the erection of great public works. The Roman Cloacæ, which remain to this day (see CLOACÆ), are the greatest of the works attributed to him. He is also said to have constructed the Circus Maximus in the valley redeemed by his system of drainage, and to have instituted the great Roman games called from it *Circenses*. (See CIRCUS.) He began the wall round the city. He is also said by some authors to have commenced, and by others to have vowed the building of the capitol, which was carried out by his son Tarquinius Superbus, in honour of Jupiter, Juno, and Minerva. Tarquinius also added a hundred new members to the senate, and though prevented by the opposition of the augur from creating three new centuries he added to each of the existing centuries a new one under the same name. For the political significance of these changes see ROME. After a reign of thirty-six years, or thirty-eight according to the legends, he was killed by assassins employed by the sons of Ancus Martius in B.C. 578.

TARQUINIUS, LUCIUS, surnamed *Superbus*, the last of the legendary kings of Rome, was the son of Lucius Tarquinius Priscus. Tarquinius Priscus left two sons, Lucius and Aruns, who were too young to succeed him, and his son-in-law, Servius Tullius, was chosen his successor. The reign of Tullius was distinguished by extensive constitutional reforms, which excited the patricians against him. Supported by them, and prompted by ambition, Tarquin, on reaching man's estate, murdered his father-in-law (the date usually given for this event is B.C. 534), and assumed the regal dignity without election as a hereditary right. In the accounts given of his reign he is represented with all the distinguishing characteristics of a tyrant. He abolished the privileges conferred by his predecessor on the plebeians; but though raised by a patrician faction, he did not favour the patricians. He banished or put to death the senators whom he suspected, never filled up the vacancies in the senate, and rarely consulted that body. He continued the great works of his father, and compelled the populace to labour in them for inadequate pay. While he thus established his tyranny at home he advanced the power of Rome abroad both by wars and alliances. By the marriage of his daughter with Octavius Manilius of Tusculum, the most powerful of the Latin chiefs, and other political measures, he caused himself to be recognized as the head of the Latin confederacy. The Latins who resisted his supremacy were compelled to submit. In a general assembly he consecrated, as the head of forty-seven Latin cities, a temple on the Alban Mount to Jupiter Latiaris. Through a stratagem of his son Sextus he obtained possession of Gabii, a Latin city which resisted him. Aided by the Latin alliance, he made war on the Volscians, and took the city of Suessa Pomœtia, the spoils of which he used to build and decorate the capitol. He formed also a close alliance with the Etrurian cities. To keep down the Volscians, and rid himself of mutinous labourers, he founded the colonies of Signia and Circeii. It was he who deposited the Sibylline books in the vault of the capitol. After a reign of nearly twenty-five years he was engaged in besieging Ardea when the conspiracy broke out by which he was exiled from Rome (B.C. 510). The cause and nature of the conspiracy are referred to in the articles BRUTUS (LUCIUS JUNIUS) and LUCRETIA. Tarquin first took refuge at Caere

in Etruria. The Etruscan cities of Tarquinii and Veii first espoused his cause, then Lars Porsenna of Clusium, and afterwards the Latin States. When all these had been vanquished, according to Roman accounts, Tarquinius, whose sons had perished in the wars, fled to Cumæ, where he died. The chronology of the story of the Tarquins is incompatible with strict historical accuracy, and many of the incidents are obviously invented, while there are others which bear at least a strong resemblance to history. Criticism and comparison of the various versions of the story by different authorities have not enabled historians to disentangle the truth from fiction. Some, as Niebuhr and K. O. Müller, hold that the history of the Tarquins points to an Etruscan conquest of Rome. Others look on this as an extreme view, and accept the main incidents as historical.

TARRAGONA, a town of Spain, capital of a province of the same name, in Catalonia, on the coast, 50 miles W.S.W. of Barcelona, at the eastern end of the fertile Campo de Tarragona, which is watered by the river Francolí. The old town, situated on a high rocky site, once surmounted by a citadel, has narrow, irregular streets, and contains the splendid cathedral, dating from the 12th–13th century, with a fine west façade and cloisters of great beauty, the archiepiscopal palace (nineteenth century), with an ancient tower, and a seminary for priests (1885). The Plaza de la Fuente, on the site of the Roman circus, separates the old town from the more regular new town to the south-west, which, near where it joins the old town, is crossed by two broad tree-shaded streets. The Paseo de Santa Clara is a fine promenade on the remains of the old Roman walls. The other edifices include the presidio or prison, the Torreón de Pilatos, also a prison, the Casa Provincial de Beneficencia, artillery arsenal, infantry barracks, &c. The town and its neighbourhood are rich in Roman remains. The spacious harbour is sheltered by a long mole, and has been recently improved. The place still ranks as a fortress. Tarragona was known to the Romans as *Tarraco*. It was captured by the Romans in B.C. 218 during the second Punic war, and made their head-quarters in Spain. It is also associated with Julius Caesar and Augustus, the latter of whom made it the capital of the province of *Hispania Tarraconensis*. It was taken by the Visigoths in 475 A.D., and by the Moors in 713. On June 29, 1811, it was captured and plundered by the French under Suchet. Its archbishop shares with the archbishop of Toledo the title of primate of Spain. Pop. in 1887, 27,225.

TARSHISH, a place frequently mentioned in the Old Testament. It is now generally identified by biblical critics with the Tartessus of the Greek and Roman writers. This name was applied to a district in the south of Spain, lying to the west of the Columns of Hercules. It is the district on the lower course of the Guadalquivir.

TARSIA-WORK, a species of mosaic or inlaying in wood, for which Italy acquired great celebrity in the fifteenth century. Patterns or pictures are produced by combinations of small tesserae of woods of various colours inserted on a walnut ground. It was formerly much used for church decorations, and patterns were made for it by the great masters of painting.

TARSIUS, a genus of *Quadrupeds* or *Monkeys*, belonging to the *Strepsirhine* group of the order, and distinguished by the insectivorous character of the teeth. The incisor teeth vary in number, and the canines are of large size. The nose is pointed, the eyes and ears being of large size. The tail is long, and usually of bushy character. The name of the genus is derived from the length of the *tarsus* or

'instep,' a peculiarity which this genus exemplifies to a very marked degree. Both fore and hind feet possess opposable thumbs, constituting these members of hand-like nature. These forms inhabit tropical Africa and the Eastern Archipelago. They are for the most part nocturnal habits, and feed on fruits and insects. They are nearly related to the Lemurs (which see). The Tarsier (*T. spectrum*) is a representative species of this genus, occurring in Borneo, Celebes, the Philippine Islands, &c. It is coloured of a general grayish brown, with olive tints over the body, and dark tints on the face, forehead, and back of the head. The tail is destitute of hairs, but possesses a tuft at its tip. These forms inhabit trees, and lead a completely arboreal life.

TARSUS, an ancient city of Asia Minor, the capital of Cilicia, now in the Turkish province of Adana, connected by railway with Adana and the port of Mersina. Anciently it was adorned by a number of magnificent buildings. Its inhabitants enjoyed the privileges of Roman citizens, and the city rose to such distinction as to rival Athens, Antioch, and Alexandria in wealth and grandeur as well as in the arts and sciences. It is venerable as the birth-place of St. Paul. It was situated on both banks of the Cydnus, which flowed into a lagoon connected with the sea, which formed its port. Its origin is ascribed to Sardanapalus. It was early colonized by the Greeks. It is mentioned in the Anabasis of Xenophon as a great and wealthy city. Tarsus was visited by Cyrus in his expedition against his brother Artaxerxes, and partially plundered by his troops. It yielded without resistance to Alexander the Great. Tarsus belonged in general to the Empire of the Seleucids, but was for a short time connected with Egypt under the second and third Ptolemy. Pompey made Cilicia a Roman province. Out of compliment to Caesar, who paid the city a personal visit, the inhabitants changed its name to Juliopolis. It was plundered by Cassius, but Antony and Augustus heaped favours on it. It became a place of importance in the wars of the Romans with the Parthians and the Persians. It was taken by the Saracens in 640, after which its importance declined. Pop. 8500.

TARTAR, CREAM OF. See TARTARIC ACID.

TARTARIC ACID. The juice of grapes, tamarinds, unripe mountain-ash berries, pine-apples, mulberries, and many other fruits and vegetables, contain this acid, usually in combination with potassium or sodium. In grape-juice tartaric acid exists as bitartrate or acid tartrate of potassium; as the grape-juice ferments this salt is gradually precipitated, because of its insolubility in dilute alcoholic liquids. The precipitated salt, which is always more or less coloured, is sent into commerce under the names of *crude tartar* or *argol*; when purified by crystallization it is known as *cream of tartar*. The colour of tartar varies from pale pink to dark red, according as it has separated from white or red wines; it usually contains about 75 per cent. of acid tartrate of potassium, with varying quantities of tartrate of calcium and impurities. Tartar is the source from which the greater part of the tartaric acid of commerce is derived. The crude tartar is purified by solution in water and addition of clay—whereby the colouring matter is precipitated—decantation, and crystallization. Tartaric acid is obtained by adding carbonate of lime in powder to a boiling solution of the purified salt so long as any effervescence is excited: tartrate of calcium is formed and precipitated, while neutral tartrate of potassium passes into solution. By the addition of calcium chloride to the filtered liquid a fresh quantity of tartrate of calcium is obtained; this is added to that originally formed, and the whole is decomposed in a leaden cistern by

dilute sulphuric acid. Calcium sulphate is precipitated, while tartaric acid remains in solution, and by evaporation is obtained in a crystallized form. The crystals are tables or prisms, white, and nearly transparent. Their taste is sour, and they deeply reddened vegetable blues. They are very soluble in water, and form a solution so concentrated as to have an oily appearance. By the action of very strong nitric acid tartaric acid is converted into oxalic acid. Tartaric acid has the formula  $C_4H_4O_6$ ; it is generally looked on as a dibasic acid, and forms a series of salts the general formulae of which are  $M_2H_2C_4O_6$  and  $M'H_2C_4O_6$ , where M and M' respectively represent monovalent and divalent metals.

Of these salts the tartrates of potassium, of potassium and sodium, and of potassium and antimony are the most important. Two tartrates of potassium are known—the acid tartrate ( $KH.C_4H_4O_6$ ) and the normal tartrate ( $K_2C_4H_4O_6$ ). The former, when pure, is found in trimetric crystals, which are but slightly soluble in water, and insoluble in alcohol. When strongly heated in closed vessels this salt leaves a residue of carbonate of potassium and carbon known as *black-flux*. The double tartrate of potassium and sodium ( $KNaC_4H_4O_6.4H_2O$ ) is commonly known as *Rochelle salts*. It is prepared by adding four parts of cream of tartar and three parts of crystallized sodium carbonate, in successive small quantities, to twelve parts of boiling water, evaporating, and crystallizing. This salt forms large rhombic prisms, which are soluble in water. The double tartrate of potassium and antimony, generally called *tartar-emetic*, has the formula  $2K(SbO).C_4H_4O_6.11H_2O$ . This salt was known as long ago as the end of the fifteenth century; it is prepared by boiling three parts of antimonious oxide ( $Sb_2O_3$ ) for half an hour with four parts of cream of tartar dissolved in water. Tartar-emetic crystallizes in octahedra, which are somewhat soluble in cold water. It is used in medicine; in large doses it is poisonous.

The formula given for tartaric acid expresses the composition of five acids, which are more or less distinguished by their chemical and physical properties. The names and chief points of distinction of these acids are as follows:—

- (1.) *Dextro- or ordinary tartaric acid*: anhydrous rhombic crystals; rotates the plane of a ray of polarized light to the right.
- (2.) *Levo-tartaric acid*: crystallizes in similar form with the foregoing, but turns the plane of the polarized ray to the left.
- (3.) *Para-tartaric or racemic acid*: hydrated triclinic crystals; optically inactive, and may be separated into (1.) and (2.).
- (4.) *Meso-tartaric acid*: optically inactive, but cannot be separated into (1.) and (2.).
- (5.) *Meta-tartaric acid*: deliquescent and uncrystallizable.

TARTARUS, in Greek mythology, a son of Æther and Ge, and by his mother the father of the giants Typhæus and Echidna. In the Iliad Tartarus is a place below Hades closed with iron gates. The later poets sometimes describe Tartarus as a place of punishment for the wicked; sometimes they use it as synonymous with Hades.

TARTARY, TARTARS. See TATAR.

TARTUFE, the chief character in Molière's comedy of the same name. Tartufe is a hypocrite; and the word is at present used to designate such not only in French but also in other languages. According to some authorities the character of Tartufe depicts the Abbé Roquette, bishop of Autun, an influential ecclesiastic, well known in society at that time, who was particularly fond of truffes (in French dialects *tartouffe*).

**TASHKENT**, or **TASHKEND**, the capital of Russian Turkestan and of the province of Sir-Daria, formerly in the khanate of Khokand, a few miles from the Tahirshik, and about 40 from its confluence with the Sir-Daria or Jaxartes, in a fertile oasis. It consists of an old town and a new or Russian quarter. Its former walls, which were 12 miles in circuit, have now fallen into ruins. The streets in the old town are very narrow, not, however, in consequence of the crowding of the houses, but of the number of gardens and vineyards, whose walls approach so nearly as to leave only lanes between them. The water led from the river by canals furnishes a copious supply to numerous fountains, and almost every house has its cistern and its bath. The principal buildings include several large mosques, a very extensive bazaar, numerous colleges, and a number of old temples surmounted by cupolas. The Russian district of the city has broad streets lined with trees, and contains gymnasia, a public library, observatory, museum, a citadel, various civil and military establishments, arsenals, &c. The inhabitants are employed in raising corn, cotton, rice, in weaving silk and cotton goods, making articles in leather and felt, &c. It is the terminus of a branch of the Transcaspien railway from Khojend. The trade is very extensive. Tashkent was taken by Russia in 1865. Pop. (1897), 156,506.

**TASMANIA**, formerly **VAN DIEMEN'S LAND**, an island in the Southern Ocean, and a state in the Commonwealth of Australia, is fully 100 miles south of Australia, from which it is separated by Bass's Strait. It lies between lat. 40° 40' and 43° 38' s., and lon. 144° 30' and 148° 30' e. Its greatest length, north to south, in meridian 147°, is 186 miles. Its mean breadth in parallel 42° is 165 miles. The island may be roughly described as heart-shaped, being considerably broader at the northern than at the southern extremity. The coasts are all much broken and indented, and generally bold and rocky, making the natural harbours, especially on the west coast, fewer than might be anticipated, although the island is on the whole well supplied with excellent harbours. The islands surrounding and belonging to Tasmania are numerous, the principal being the Furneaux group, on the north-eastern extremity, separated from the mainland by Banks' Strait. At the opposite extremity of Bass's Strait there are several smaller islands, such as King's Island and Robbin's Island. The area of the mainland is 24,330 square miles, and with the dependent islands 26,215 square miles, being thus not a great deal smaller than Scotland. The island is remarkably mountainous, and contains much fine and varied scenery, while its climatic and other attractions make it altogether an agreeable place of residence. The series of valleys traversed by the railway from Hobart on the south to Launceston in the north may be taken as marking a division of Tasmania into an eastern and a western portion, the former much smaller than the latter, but both equally mountainous. The highest summit of the eastern mountains, and the second highest in the island, is Ben Lomond, 5010 feet high; and among the other chief peaks of the division are Mt. Barrow (4644), Mt. Victoria (3964), Ben Nevis (3910), and Row Tor or Ben Arthur (3895), all in the north-east of the island. The highest mountain of the western division and of the whole island is Cradle Mountain (5069), in the Du Cane Range; and the other chief summits and ranges of the west are the Eldon Range (4789), Frenchman's Cap (4756), Ironstone Mountain (4736), Mt. Field (4721), Mt. Hugel (4700), Wyld's Crag (4399), Black Bluff (4381), Mt. William (4360), Dry's Bluff (4275), and Mt. Wellington (4166), near Ho-

bart. Granite and metamorphic rocks prevail in the north-east and south-west, and elsewhere intersecting ridges of greenstone inclose plains or valleys of Palaeozoic age. The evidences of volcanic action are abundant. The greatest river is the Derwent, which issues from the mountain lake of St. Clair in Lincoln county, and flows south-east into Storm Bay, receiving numerous affluents, among which are the Nive, the Dee, the Ouse, the Clyde, the Jordan on the north or left bank, and the Florentine, Russell, Styx, and Plenty on the right. The other principal rivers flowing east and south-east are the George, the Coal River, and the Huon; the Davey, the Gordon, King's River, the Corinna or Pieman, the Arthur, with numerous tributaries, flow in westerly directions and discharge on the west coast. Numerous rivers flow to the north and discharge into Bass's Strait. Among these are the Forth, the Mersey, and the Tamar, a tidal river formed by the confluence of the North and South Esk, the latter of which, among other tributaries, receives the Macquarie. The principal harbours and bays on the west are Port Davey and Macquarie Harbour; on the north coast, Stanley, Emu Bay, Port Frederick, Port Sorell, Port Dalrymple, and Waterhouse Roads; on the east coast, George's Bay and Oyster Bay; on the south-east, Port Arthur, Storm Bay, Norfolk Bay, and D'Entrecasteaux Channel. The harbours and anchorages in the bays and channels of the south-east coast are numerous and excellent. The chief lakes are Great Lake, covering an area of 28,000 acres; Lake Sorell, 12,300 acres; Lake St. Clair, 9400 acres; Lake Echo, 8500 acres. The colony is divided into eighteen counties: Wellington, Devon, and Dorset on the north coast; Cornwall, Glamorgan, Pembroke, Monmouth, and Buckingham on the east coast; Kent on the south coast; Arthur, Montgomery, Franklin, Montagu, Russell, on the west coast; and Lincoln, Westmoreland, Cumberland, and Somerset, wholly in the interior. There are twenty municipalities besides Hobart, which is the capital, and Launceston.

The climate of Tasmania is very mild. Mount Wellington is frequently covered with snow even in the summer months; but at Hobart, in its immediate vicinity, snow rarely falls. The ozonometer indicates a high degree of purity in the atmosphere. The north-west hot winds of Australia reach Tasmania greatly modified by passing over Bass's Strait. During the summer months the land and sea breezes alternate every twenty-four hours. There is little thunder. September, October, and November are the spring months, during which the mean temperature is 54°. In December, January, and February, the summer months, during which there is little rain, the average temperature is 62°, extreme 100° to 110°. The autumn months are March, April, and May, temperature about 55°; winter months, June, July, and August, average temperature 47°. The mean temperature throughout the year is about 55°. The average rainfall is about 24 inches.

The soil of Tasmania is in some parts rather poor, but in many places exceedingly rich and productive. The central plateau affords fine pasture. Most of the European grains, fruits, and vegetables are cultivated with success, but some of the cereals have been much affected by rust. Wheat, oats, barley, potatoes, peas, beans, and hops are largely cultivated. Fruits of many different kinds are easily grown, including grapes, cherries, plums, quinces, mulberries, peaches, apricots, walnuts, filberts, almonds, figs, gooseberries, strawberries, raspberries, and currants. Fruit preserving forms an important branch of industry. The annual export of fruits is now of considerable importance, green fruits and preserves exported in

1900 being valued at £279,988. The total number of acres under cultivation is about 520,000. In 1892 a Council of Agriculture was appointed for the advancement of agriculture, by holding congresses, carrying on experiments, and advising or assisting farmers. It has power to establish boards of agriculture throughout the state.

Kangaroos and other herbivorous animals of the pouched kind are more numerous here than in Australia. There are also two marsupial carnivorous animals, called the Tasmanian Wolf, or hyæna (*Thylacinus cynocephalus*), and the Tasmanian Devil (*Sarcophilus ursinus*), both of which are destructive to sheep. The latter, which is often called the native tiger, is still more destructive to poultry. The indigenous fauna is said to include some 26 mammals (12 being peculiar to the island), about 160 birds (some 15 peculiar), 7 species of lizards, 3 venomous snakes (tiger, copperhead, and whip), 7 kinds of frogs, and 21 fresh-water fishes. Other animals have been acclimatized, among them the salmon and the rabbit, the latter now a serious plague. The natural forests are chiefly of the blue gum-tree (*Eucalyptus globulus*), the Huon pine (*Dacrydium Franklinii*), much used for boat-building and other constructive purposes, the wattle (an acacia), blackwood, and King William pine. Among the minerals are gold, silver, copper, iron, tin, coal, freestone, limestone, and roofing slate. The amount of gold raised in 1900-01 amounted to the value of £306,500. In 1872 abundance of tin was discovered at Mount Bischoff, in Russell county, and this discovery gave a great impetus to the mining industry. Copper is worked chiefly at and near Mount Lyell. In 1889 important discoveries of silver were made, more especially at Mount Zeehan, whence rich results have been since obtained. Smelting-works have been erected at Hobart for the iron which abounds in that district. Excellent hematite iron ore is found at Ilfracombe, near the Tamar, and at the Blythe river on the north-west coast. Coal is found abundantly in Cornwall, Devonshire, on the Mersey, at Hamilton, in Monmouthshire, and elsewhere. Coal-mining is carried on, and native coal is now largely used for steam and domestic purposes. Building-stone quarries are worked pretty largely, and stone is exported to Melbourne.

First among the industries may be mentioned brewing, the climate of Tasmania being specially adapted for malting and brewing, as well as hop growing. Home-brewed beer has already almost superseded imported beer, and an export trade in that product to New South Wales and Victoria is carried on. Cider is also made. Tanneries, soap and candle works, jam-making establishments, coach-works, agricultural-implement works, brass-foundries, woollen-cloth manufactories, flour-mills, tin-smelting works, silver-smelting works should also be mentioned. There are salmon and trout breeding establishments, from which ova and fry are sent to the neighbouring colonies.

The first line of railway in Tasmania, that connecting Launceston with Deloraine, 45 miles in length, was opened in February, 1871. A main line from Hobart, the capital, to Launceston, 120 miles in length to its junction with the first line, and other lines, have since been constructed, bringing the total mileage to nearly 600 miles in 1900. There are also tramway lines. Telegraphic communication was established with Victoria in 1869, and with England in 1872.

The exports of Tasmania for 1900 amounted to £2,610,617; the imports were £2,073,657. The principal exports were copper ore and smelted, fruit, tin ore and smelted, wool, silver and galena, and

gold. The government revenue as estimated for the year 1902 amounted to £716,500, estimated expenditure £840,000. The debt of the colony at the end of 1900 was £8,551,745, the greater part of which has been incurred on public works.

The constitution of Tasmania was settled by the local act 18 Victoria, No. xvii. (1854), as amended by subsequent acts (1871, 1885, 1896). There is a parliament consisting of a Legislative Council and a House of Assembly. The former is composed of nineteen members not under thirty years of age, natural-born or naturalized subjects of the crown, possessing a freehold of £15 or other qualifications. They are elected for six years. The House of Assembly consists of thirty-seven members, who must be twenty-one years of age, and subjects of the crown. They are elected for three years. The electors are those who are enrolled as owners or occupiers of property or others duly qualified. The governor is appointed by the crown, and is head of the executive and commander-in-chief. He has a responsible cabinet of four official members, the colonial secretary, treasurer, and minister of education, attorney-general, and minister of lands and works and mines. The members of the cabinet must have a seat in Parliament. The most important religious body in Tasmania is the Church of England, to which fully half of the colonists belong. Next in numbers are the Roman Catholics, being about 17 per cent of the whole. Primary education is compulsory; secondary and higher education is supported by means of exhibitions and scholarships. There is a university, but it only holds examinations and grants degrees.

*History.*—Tasmania was discovered on 1st December, 1642, by Abel Jansen Tasman, who rounded its southern cape on a voyage of discovery from Batavia, and named it after Van Diemen, the governor of the Dutch East Indies. It was visited by Cook in 1769, and during the next twenty years by various navigators, some of whom, as D'Entrecasteaux, have left their names on its shores. In 1797 Bass discovered the strait which has been called after him. The first settlement on it was made in 1803 by a guard with a body of convicts. The locality fixed upon was Restdown or Risdon Cove, on the east side of the Derwent, but was soon afterwards changed for the site now occupied by Hobart. Port Dalrymple, on the north side of the island, was settled in 1804 by an expedition from Sydney, which two years later laid the foundations of Launceston. One great service rendered by the convict system, which could hardly have been effected by free labour, was the formation, under great engineering difficulties, of an excellent road from the north to the south of the island, connecting Launceston with Hobart Town. The settlement of the country at first made slow progress, but land regulations having been adopted similar to those of New South Wales, cultivation and pasturage were successfully inaugurated and made rapid progress. The land was divided into allotments of from  $\frac{1}{2}$  square mile to 4 square miles, which were granted to applicants in proportion to their capital, at the rate of a square mile to every £500. Farming stock and government pensions were reckoned as capital. In consequence of the last regulation many retired naval and military officers became settlers. Convict labour was supplied, and at a very moderate expense farms were cleared for cultivation. Sheep, cattle, and horses were introduced, and the raising of stock has always been carried on with great success. It was some of the Tasmanian sheep-farmers that first settled the colony of Victoria. Up to 1824 Tasmania was a dependency of New South Wales, but in that year it was made an independent



colony. For a series of years the prosperity of the colony was retarded by the hostility of the natives and the depredations of escaped convicts, known by the name of bush-rangers. The aborigines were very similar to those of Australia, though rather superior. They at first were disposed to be friendly to the settlers, but being driven from their hunting-grounds they declared war to the knife against the whites, and, as was natural, got the worst of the struggle. Their numbers, originally estimated at 6000, dwindled away, and at last about 300 of them, all that were left, were removed to Flinders Island. They still continued to decrease in number, and when, in 1847, they were removed to the vicinity of Hobart Town, only 45 were left. They have since died out altogether, but there still exists a half-breed race, the offspring of native mothers and white fathers, who are of a copper colour and said to be handsome. The bush-rangers caused even more trouble than the aborigines, and the war against them was even more protracted; but at length, by liberal rewards for their apprehension and other means, they were finally suppressed. After the suppression of bush-ranging the Tasmanians began to petition against the importation of convicts, and to encourage those in the island to escape to Port Philip, till the Victorians revolted against the influx of abandoned characters. In 1853 transportation was abolished, and about the same time the name of Tasmania was officially adopted on the petition of the colonists. Gold was discovered in Australia in 1851, and very soon a rapid emigration from Tasmania to Australia began to take place, and continued till the colony suffered severely from want of labour. This naturally gave a great check to its prosperity, but for years it has now been fairly prosperous and progressing with moderate rapidity. The quantities of gold and tin obtained have given it a considerable impetus, and with its excellent climate and natural advantages there is no doubt of its ultimate prosperity. Since Jan. 1, 1901, Tasmania has been one of the states of the Commonwealth of Australia. It has six representatives in the federal senate and five in the federal house of representatives. The pop. of Tasmania in 1881 was 115,705, while that of 1870 was 99,328; in 1891 it was 146,667; in 1901 it was 172,475 (89,624 males, 82,851 females).

TASMANIAN DEVIL. See *DASYUR.*

TASSANIAN WOLF. See *WOLF.*

TASSO, BERNARDO, an epic and lyric poet, father of the more famous Torquato, born at Venice of a noble family of Bergamo in 1493. His education was conducted with great care, and he not only cultivated the lighter literature, but devoted himself to the study of politics. He had already become known as a poet throughout Italy when Guido Rangone, general of the pope and a patron of learning, took him into his service, and employed him in managing the most difficult negotiations with Clement VII. at Rome and Francis I. in France. Bernardo subsequently entered into the service of Renata, duchess of Ferrara, but soon left her court, and went first to Padua and then to Venice. Here he published a collection of his poems, which gave him a place among the first of living poets. Ferrante Sanseverino, prince of Salerno, engaged him in his service, in 1531, as secretary, on honourable and advantageous terms. When the prince followed Charles V. to Tunis, in a galley equipped at his own cost, Tasso accompanied him, and after his return was sent on public business to Spain. In 1539 he married the rich and beautiful Porzia de' Rossi, and retired, with the consent of the prince, to Sorrento, where he lived till 1547. But the misfortunes of his master, whose estates had been seized by Charles V. on account of his opposition to the intro-

duction of the Inquisition into Naples, involved Tasso in the greatest embarrassments. He was compelled to seek another place of refuge, and was finally invited by the Duke of Urbino to take up his residence at Pesaro. The leisure which he now enjoyed was employed in finishing his *Amadigi*, which he published at Venice in 1560. In 1563 the Duke of Mantua engaged him in his service, and appointed him governor of Ostiglia, where he died in 1569. His remains were interred at Mantua under a handsome monument erected by the duke, with the inscription *Ossa Bernardi Tassi*, but his son Torquato afterwards removed them to Ferrara. His chief work, *L'Amadigi di Gaula*, a romantic epic, displays much talent and art; in the expression of the tender passions, in his descriptions of nature, in vivid delineations of adventures and battles, all the ornaments of poetry are happily introduced. His lyrical and other poems, in five books, are among the most charming productions of the Italian muse. We have also a *Discourse on Poetry*, and three books of *Letters* from his pen.

TASSO, TORQUATO, the great Italian epic poet and rival of Ariosto, son of the preceding, was born at Sorrento, 11th March, 1544. He was early sent to the school of the Jesuits at Naples, and his father being an exile, his education was at first superintended by his mother, whom he quitted at ten years of age to rejoin his father at Rome, and never saw again. At this time he could appreciate and recite from memory the great Greek and Latin poets. He subsequently pursued his studies under his father's superintendence at Rome, Bergamo, Urbino, Pesaro, and Venice. Before the age of sixteen he was employed by his father to copy, amend, and complete his poem *L'Amadigi*; yet his father was unwilling that his son should adopt the vocation of a poet, and sent him to Padua to study law. Young Tasso spoke of his legal studies as a burden which oppressed him, but he managed to steal time for more congenial pursuits, and at the age of seventeen, to the surprise of all Italy and the indignation of his father, he produced the *Rinaldo*, an epic poem in twelve cantos. The disappointment of the father yielded at length to genuine admiration of this juvenile production, which placed Tasso high among the imitators of Ariosto, and he reluctantly consented to allow his studies to take a literary turn. The reputation of his poem procured for Torquato an invitation to the University of Bologna, which he accepted. Here he displayed an aptitude for abstract discussions and the study of philosophy. His favourite philosopher was Plato. He left Bologna on account of the apparently unjust attribution to him of a satire, in which he himself came in for a share of ridicule. After visiting friends at Castelvetro, Modena, and Correggio, he returned to Padua on the invitation of an old and constant friend, Scipio di Gonzaga. Here he continued the study of Plato, and wrote three *Discorsi del poema eroico*. He had already determined to throw off the yoke of Ariosto, and taking Virgil for his model, to become his rival. He had chosen the theme, and begun to construct the plan of his great poem the *Gierusalemme Liberata*, which he at first called *Goffredo*. The plan of this poem was of a highly prudential character, and exhibited an ambition as practical as it was daring. By celebrating all the great European houses who had taken part or might artfully be thrust into the crusade of Godfrey, he hoped to make himself many powerful friends, and thus to acquire additional assurance of immortality. While he was elaborating this life-project he secured, what in those days was deemed indispensable to a literary aspirant, a patron, in Cardinal Louis d'Este, to whom he had dedicated

his Rinaldo. The princes of Italy at this time deemed it their chief honour to be esteemed the patrons of art and literature. The munificence of the Medici is well known, and among the most formidable rivals of their glory was the house of Este. Their court at Ferrara was the resort of literary men from all parts of Europe. The cardinal retained 500 gentlemen in his retinue, and Tasso was named one of them. He was introduced by the cardinal to the court of Ferrara. Here everything that could be wished to supply inspiration, except that which is indispensable to the life of poetry, independence, was to be found. The Academy of Ferrara supplied learned associates with whom Tasso engaged in philosophical discussions; the courtiers were easily transformed into paladins, and the court ladies into heroines, whose imaginary achievements the poet recorded with daily diligence. Thus the *Giernusalemme* grew at the court of Ferrara. That nothing might be wanting to his experience, the happy bard engaged in a liberal course of courtship on his own account. His attentions were impartially bestowed upon beauty, whether found in the lady or the lady's maid; but Tasso was personally as well as poetically ambitious. There were at the court of Ferrara two sisters of the reigning duke, Lucrezia, the elder, the wife of the Duke of Urbino, and Leonora, the younger, a virgin of thirty, and about nine years his senior. For both of these Tasso appears to have sighed, sentimentally at least, though by some Lucrezia, and by others Leonora is supposed to have had the preference. In high favour with the ladies, by whom his attentions were received as the gallantries of a courtier and a poet, and with their brother Alfonso, who served as the living representative of Goffredo, it would be impossible to imagine a more splendid slave than the gifted poet had now become. Tasso arrived at the court of Ferrara on 30th October, 1565, on the eve of the first marriage of Alfonso. In 1571 he accompanied the cardinal on an embassy from the pope to Charles IX. of France. At this time eight cantos of his great poem were in circulation in manuscript at the court. He worked at it *en route*. He was received with distinction at the court of France, which he followed to Blois, Tours, and Chenonceaux. Ronsard, the leading poet of the French pleiad, received him in the most friendly spirit. A quarrel with his patron, which is variously attributed to his exhibiting too much and too little zeal for Catholicism against Huguenot, compelled his departure from the French court, and he returned to Ferrara penniless. On his return to Ferrara, Alfonso, at the solicitation of his sisters, received him into his own service. In the spring of 1573 he brought out the *Aminta*, a pastoral, which was represented at the court of Ferrara. It was full of the court shepherdesses, and is still considered the most chaste and graceful composition of the kind that has yet appeared in Italy, although many critics prefer the *Pastor Fido* of Guarini, a poem which appeared soon after it. In April, 1575, he was able to announce the completion of the *Giernusalemme*. Alfonso was eager for its immediate publication, but this judicious counsel was not heeded by the poet, whose sensitive mind dreaded censure even more than it coveted applause. The censure of the church in particular was the object of his terror, for he was sincerely devout and regarded his poem as a religious work; but at the same time he loved the applause of the world, and had taken means to secure it about which his own conscience was far from being at ease. In these circumstances he sent his poem to his friend Scipio Gonzaga, now a cardinal at Rome, requesting his judgment. Scipio assembled a consulta of churchmen and critics to sit upon the

*Giernusalemme*. Their incoherent and contradictory censures, literary and ecclesiastical, racked the delicate mind of the poet with a thousand tortures. He began to defend himself on the one hand, and to amend and modify to meet the views of his critics on the other. He had now set himself an impossible task. As a poet mythology, romance, and chivalrous adventure were dear to him. As a churchman he was told he ought to be content with monks and nuns as his auditors, and to renounce all such profanities as unworthy of the story of a hero of religion. Had the conflict been external only he might have borne it, but it raged most fiercely in his own mind, and his mind, divided between all that he esteemed in art and all that he dreaded in religion, gave way. To add to his distraction his work at this time was printed piratically without his own revisions. Alfonso wrote a vigorous protest against this disgraceful proceeding to all the Italian courts, but suspicions of his favour at court began also to fill the overburdened mind of Tasso. His uncommon favour had always excited the envy and jealousy of detractors, but the arts which are despised by a healthy mind become formidable to a diseased one. He believed that he was persistently calumniated at court, and systematically misrepresented to the Inquisition. On the 17th of June, 1577, he drew his poignard in the apartment of the Duchess of Urbino. He was immediately arrested, but was set at liberty after two days' confinement, and recommended to retire to his country-seat. To soothe his mind a letter was procured from the Inquisition assuring him that there was no charge against him; but he still suspected that the office of Ferrara was ignorant of the designs of that at Rome. At his own request he returned to Ferrara, to the convent of St. Francis; but on 20th July he made his escape, and travelled in disguise to his native place, Sorrento, where he stayed with his sister Cornelia till the end of summer. Improved in health and wearied of solitude, he now solicited leave to return to Ferrara, and repaired with this object to the agent of the duke at Rome. A cold permission to return on condition of surveillance was obsequiously accepted. Into the long story of his alleged wrongs we cannot duly enter. Alfonso is accused of arbitrarily imprisoning him, first, from offence at the imprudent addresses paid to his sister; secondly, from jealousy of the Medici, from whom he had received an offer; and thirdly, from apprehension that the poet would strike his own name and the glory of the house of Este out of his work. Up to the time of the incident already mentioned Tasso had lived on intimate terms with Alfonso and his two sisters, especially Lucrezia, who had been dismissed by her husband and kept him as her constant companion. He had hesitated about accepting the offer of the Medici, and thought himself not well treated at Ferrara, but at the beginning of the year 1557 he put away, out of gratitude to the Este family, all thoughts of another service. After many complaints of the retention of his manuscripts and other ill-treatment, he again escaped from Ferrara, and wandered, sometimes in want, through Padua, Venice, Urbino, and Piedmont, and finally returned to Ferrara 21st February, 1579, on the eve of the duke's second marriage. Finding himself treated with complete neglect, he broke out in loud complaint ('*false e pazzie e temerarie parole*,' are his own expressions), was seized and imprisoned as a madman in the hospital of St. Anne of Ferrara. His treatment, probably less from design than from neglect to give instructions, was at first of the harsh kind to which lunatics were formerly commonly subjected; but soon his confinement was made more agreeable, and he was permitted to see his friends. Among others he was visited by Montaigne.



At this time his work was condemned by the Academy della Crusca, to whom he replied with moderation. He remained in the hospital of St. Anne till July, 1586, when he was released at the solicitation of Vincent di Gonzaga, who took him into his estates. The duke refused him a parting interview. It is only fair to say that even before the imprisonment of the poet he had been wearied by his incessant and contradictory complaints. Tasso now resided at Mantua, and wrote the tragedy of *Torrismondo*, which with a genealogical poem he dedicated to Vincent di Gonzaga. Finding that Mantua did not agree with him, he proceeded to Rome and afterwards to Naples, the climate of which he found most congenial, and where he fixed his favourite residence at the monastery of Mount Oliveto. Here he composed the *Gierusalemme Conquistata*, which he dedicated to Cardinal Aldobrandini. It is a reconstruction of the *Gierusalemme Liberata*, in which he rejects the chief mystical and chivalrous ornaments of the previous poem, and plumes himself on a precise and slavish imitation of the *Iliad*. He wished it completely to supersede the *Liberata*, but posterity has emphatically reversed his decision. Aldobrandini solicited and obtained from the pope the laurel crown on behalf of Tasso. Urged by his patron, Tasso repaired to Rome, although he declared it was to die. Amid the preparations for the ceremony his health gave way. He retired from the plaudits of the public to the convent of Santo Onofrio, where he expired on 25th April, 1595. Tasso wrote numerous works. There is an edition published at Pisa, 1821–32, in thirty-three vols. 8vo. Those on which his fame rests are the *Gierusalemme Liberata*, the *Rime*, and the *Aminta*. His letters are interesting, particularly those describing his visit to France. The best English translation of the *Gierusalemme* in many ways is still that executed by Edward Fairfax in 1600. His great poem the *Gierusalemme* divides, with the *Orlando* of Ariosto, the fame of being the greatest Italian epic. Both are full of poetical graces, and marvellous for the interest and variety of the narrative, but those who prefer regularity of plan and symmetry of structure give the preference to Tasso, while those who delight in daring liberty and almost licentious contempt of the conventionalities of art praise the work of Ariosto. Metastasio gave his judgment with much hesitation in favour of Tasso.

**TASTE.** See **TONGUE**.

**TATARS or TARTARS, TARTARY.** The name *Tartar* (corrupted from *Tatar*) has been used in modern very much like the term *Scythian* in ancient times. Both designate a roving people known for their incursions and conquests among neighbouring nations over a wide extent of territory; both are names of foreign application, that is, they have been given to, not assumed by the peoples designated by them; finally, the incursions of both have extended over a large part both of Europe and Asia, and their local seat has been found both in ancient and modern times in the steppes or uncultivated regions which connect the two continents, on the north of China, in Turkestan, and on the shores of the Caspian and Black Sea. These disturbers of the peace of settled nations have consisted both in ancient and modern times of numerous associated tribes, whose origin and wanderings lie without the domain of history, and form the theme of speculation, conjecture, and analytical research to the philologist, the antiquarian, or the ethnological student. These historical names are thus terms of ignorance, applied originally through some accidental circumstance, and Gibbon gives to both their full generic significance when he says, 'In speaking of all or any of the northern shepherds of Europe or Asia I indifferently

use the appellations of *Scythians* or *Tartars*.' During the decline of the Roman Empire regions now settled and civilized of the north of Europe poured out similar hordes under the equally mysterious names of *Goths* and *Vandals*. For an account of the ancient use of the term *Scythian* see **SCYTHIA**.

The name *Tatar* or *Ta-ta* appears to have been the name of a tribe of Mongols who occupied about the ninth century a district of Chinese Tartary on the Upper Amur. This tribe was dispersed by the attacks of neighbouring Mongols, and carrying the terror of its arms in different directions its name came to be applied by the Chinese to various hordes of Mongol robbers. The true *Tatars* formed part of the horde of Genghis Khan, when that conqueror carried his arms from the country known as Chinese Tartary to Europe, and through some accidental circumstance the name came to be applied to the whole Mongol horde, as well as to the successive hordes of similar origin who followed in their footsteps, and to the districts from which they came, or in which they settled; hence the names of Chinese Tartary, Independent Tartary (see **TURKESTAN**), and European or Little Tartary, comprising most of the Russian governments of Orenburg, Astrakhan, Ekaterinoslav, the Cossack provinces, and the Crimea. For the incursions and conquests of these peoples see **GENGIS KHAN**, **GOLDEN HORDE**, **MONGOLS**, **RUSSIA**, &c. The name *Tartars* has, for reasons similar to those already given, been long applied in Europe to the Manchoo conquerors of China. The Manchooks are *Tatars* in the generic sense of the term. (See **MANCHOORIA**.) A curious account is given of the origin of the form *Tartar*. It is said to have arisen from a pious expression of St. Louis, who, on hearing of the devastations of the horde of Genghis Khan, piously addressed to the Virgin his hope, that if those whom we call *Tartars* come hither, we may either send them back to the Tartarian regions (punning upon the similarity of the name *Tatar* to *Tartarus*, the lower world) from which they came, or they may send us to heaven.

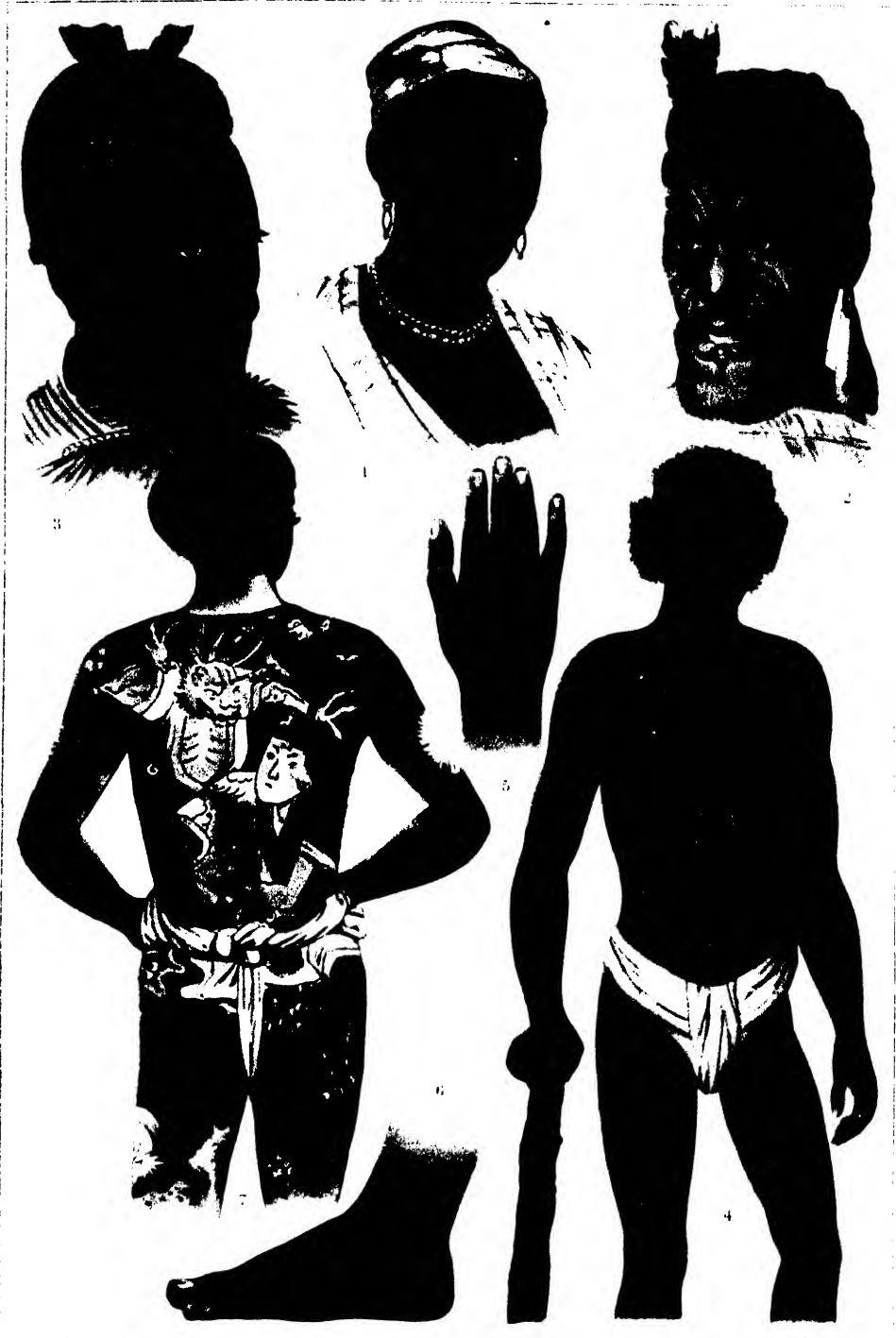
**TATE, NAHUM**, an English poet, was born in Dublin about the year 1652, and after receiving a classical education at Trinity College, went to London, where he obtained the patronage of the Earl of Dorset. On the death of Shadwell the interest of his friends procured him the situation of poet laureate to William III. This post he held through that and the succeeding reign; and he even lived long enough to write the first birth-day ode on George I. He died in the Mint, whither he had retired from his creditors, in 1715. He was the author of *Brutus of Alba*, a tragedy; *Duke and no Duke*, a farce; and some other dramatic pieces; a collaborateur of Dryden in a second part of *Abesalom* and *Achitophel*, published in 1684, of which all but 200 lines was written by him, and the author of an edition of *Lear*, which long kept the stage in place of the original; but it is by his metrical version of the *Psalms* of David, executed in conjunction with Dr. Nicholas Brady, and commonly affixed to the liturgy of the Church of England, that his name is now principally known. Several elegies and other occasional pieces also proceeded from his pen.

**TATIAN**, an early Christian apologist, was born near the beginning of the second century in Assyria. He made a profound study of Greek philosophy and travelled throughout the Roman empire as a wandering teacher or sophist, but he became increasingly dissatisfied with the philosophical systems of his time and disgusted with the low state of morality around him. At Rome about 150 he came to know the Old Testament and the Christians, and the lofty character of the latter soon led him to





# TATTOOING.



1. NEGRESS. 2. NEW ZEALAND CHIEFTAIN. 3. NEW ZEALAND KING. 4. CAROLINE ISLANDER. 5, 6. HAND AND FOOT OF DAYAK OF BORNEO. 7. JAPANESE.



**adopt Christianity.** A few years later he wrote an *Address to the Greeks*, still extant, in which he displays unsparring vigour in his polemic against classical heathenism and on behalf of the 'barbarian philosophy', as he called Christianity. Tatian was a close friend of Justin Martyr, and after the death of the latter in 166 he began to be charged with teaching heretical doctrines. He adopted Gnostic conceptions regarding God, the demiurge, and the world of æons, and he admitted the existence of difficulties and contradictions in the Scriptures. In practical matters he rejected the use of wine and of animal food, and used only water in celebrating the Eucharist. He was also opposed to marriage, and he gave in his adhesion to the sect of the Encratites. He taught his heresies in several works, of which none has survived; and was answered by Tertullian, Clement of Alexandria, Hippolytus, Origen, and other Christian writers. In the latter part of his life he retired to Mesopotamia, and he died about 180, possibly at Edessa. The most notable work associated with his name is the *Diatessaron*, a kind of harmony of the four gospels. Until a comparatively recent date this work was only known by brief references in ancient writers. In 1876 Dr. Moesinger published at Venice a Latin translation of a commentary on the *Diatessaron* which had been written by Ephraem Syrus. The translation had been made in 1841 by Aucher, a Mechitarist monk, not from the original Syriac of Ephraem, for that is not extant, but from an Armenian version ascribed to the fifth century. In 1881 Zahn published his *Tatian's Diatessaron*, in which he sought to restore the work from the available materials. An Arabic version found in Egypt was edited in 1888 by Agostino Ciasca. Most scholars are of opinion that the original language of the *Diatessaron* was Syriac, but Harnack adduces reasons for believing that it was Greek. See Professor Hemphill's account in *The Literature of the Second Century* (1891); J. R. Harris's *The Diatessaron of Tatian* (1890); J. H. Hill's *The Earliest Life of Christ* (1893), a translation from Ciasca.

**TATIUS, ACHILLES**, a Greek writer probably of the fifth century, who wrote a romance entitled *Leucippe and Cleitophon*. According to Suidas he was converted to Christianity. There are editions by Hirschig (1856) and Hercher (1858), and an English translation by R. Smith (1855—with Heliodorus and Longus, in Bohn's Classical Library).

**TATTA**, a town of Sind, on the Indus, 48 miles s.s.w. of Haidarabad. The external appearance of the town is picturesque, its lofty flat-roofed houses being interspersed with fine trees; but the dwellings are unsubstantial, and internally Tatta is mean and gloomy. Pop. in 1891, 8969.

**TATTERSALL'S**, Knightsbridge Green, London, is the great metropolitan mart for horses, of which there is an auction every Monday throughout the year, and every Thursday in spring. It has acquired greater celebrity as the head-quarters of betting men.

**TATTOOING**, a word of Polynesian origin denoting the practice of making permanent coloured designs or figures in the skin by means of small punctures or incisions, which receive various dyes or pigments. A similar custom, known as cicatrization or scar-tattooing, consists in repeatedly cutting the skin at the same place so that in healing a raised scar is left. Both varieties of tattooing may be found among the same people, as in the case of the natives of the Admiralty Islands and the Egba negroes of Yorubaland. Among the Admiralty Islanders, the Fijians, the Gonds and the Todas of India, the inhabitants of the Liu-Kiu Islands, and other races

colour-tattooing is, or was, confined to the women, and the Latuka of the upper Nile valley are an example of a people among whom scar-tattooing is practised upon women only. Colour-tattooing is generally ornamental, but scar-tattooing is more frequently used to produce distinguishing tribal marks. The latter variety is practised by a number of native African peoples, while the Bangala of the Middle Congo scar the whole body for ornamental purposes. In some races there is a connection between tattooing and marriage. Thus, in the Solomon Islands a girl is not eligible for marriage until she has been subjected to an atrociously cruel process of tattooing on the face and chest, and the native Australians inflict fearful scars on the backs of their young girls before marriage. The Formosans tattoo the faces of girls prior to marriage; and among the Papuans of New Guinea unmarried girls are tattooed all over, except on the face, which is adorned in this way at the time of their marriage. Colour-tattooing of an ornamental kind reached its most artistic development among the Maoris of New Zealand and the Japanese, but both these peoples, like several others, have almost completely abandoned the practice under the influence of civilization. With the Malays tattooing appears to have been a reward of the successful head-hunter. Sailors and some other classes in Europe still tattoo, especially on the arms, to some extent.

**TAUNTON**, a mun. and parl. bor. and market town of England, county town of Somerset, in the centre of a beautiful and fertile vale on the Tone, here crossed by a stone bridge, on the Taunton and Bridgewater Canal, and on the Bristol and Exeter branch of the Great Western Railway, 36 miles s.s.w. of Bristol. It is surrounded by orchards, gardens, and rich meadows; and consists of spacious and well-paved streets, and houses mostly of brick, but generally commodious and handsome. The principal buildings and institutions of note are the parish churches of St. James and St. Mary Magdalene, the former an elegant and commodious, the latter a magnificent structure, in the decorated and later English styles, with a fine quadrangular tower; various other churches and chapels; an old grammar-school, reconstituted; a Wesleyan Methodist and a Congregational College; a mechanics' institute; an old market-house, in an open area called *The Parade*; the new market-house; the castle, still in good preservation, and containing the museum of the Somersetshire Archaeological and Natural History Society; a shire hall; the assembly-rooms, a hospital, alma-houses, &c. The industrial establishments include silk-factories, glove and paper-box works, iron and brass foundries, coach-works, breweries, &c. Taunton is of great antiquity, and from the discovery of urns containing Roman coins appears to have been a Roman station. During the civil war it was defended by the Parliamentarians against the Royalists. The inhabitants suffered much from the rebellion of Monmouth, whose cause they espoused, and who assumed the title of king here on 20th June, 1685. Jeffrey held his bloody assize here in the same year. It returns one member to Parliament. Pop. (1891), 18,026; (1901), 21,078.

**TAUNTON**, a town of the United States, in Massachusetts, 35 miles south of Boston. It is well built; and contains a great number of handsome edifices, ranged around and in the vicinity of an inclosure called *Taunton Green*, which is adorned with fine trees, and gives the whole place a peculiar charm. The manufactures consist of Britannia-ware; nails, various articles in leather, hats, straw-bonnets, chairs, bricks, &c. Iron-works, established

here as early as 1652, are still prosperous; and there is also a large number of cotton and paper mills, print-works, foundries, &c. Pop. (1890), 25,448.

**TAURIDA**, a government in the south of Russia, bounded north by Ekaterinoslaf; east by the Sea of Azof; south-east, south, and west by the Black Sea; and north-west by the government of Kherson, from which it is separated by the Dnieper; area, 23,608 square miles. It is very irregular in shape, and being united to the land only where it marches with Ekaterinoslaf for about 90 miles, may be regarded as one large peninsula, subdivided again into two minor peninsulas, of which that in the south, now called the Crimea, and well known in ancient times as the Chersonesus, is the more perfect; the isthmus which connects it with the northern portion being at its narrowest not more than 8 miles. The northern peninsula consists almost entirely of an extensive steppe, which stretches across into the southern peninsula. It is generally without a tree, and in many parts composed of parched and saline sands, where vegetation is almost extinct; but in other parts is composed of fertile loams, capable of raising any kind of crop, and often covered with verdant pastures. Simferopol is the capital city. See also the article **CRIMEA**. Pop. (1897), 1,443,566.

**TAURUS**, the Bull, the second of the zodiacal constellations. It contains the star of the first magnitude Aldebaran (in the eye), the group of the Pleiades (in the neck), and the Hyades (in the face).

**TAURUS**, a mountain-chain in Asiatic Turkey, usually considered as commencing in the east on the Euphrates, at the Nusrah Cataract, in the pashalic of Marash, whence it stretches west, nearly parallel to the coast of the Mediterranean, for above 600 miles, terminating to the north of the Gulf of Adalia. In the east it takes the name of Jebel-Kurim, in the west that of Ramadan Oglou Balakar. It sends off several branches, of which the most remarkable are Alma-Dagh, which proceeds south into Syria, and becomes linked with the chain of Lebanon; and the Anti-Taurus, which proceeds north-east, sending out ramifications which become linked with Ararat, El-burz, and Caucasus. Height over 10,000 feet.

**TAUTOG**. See **BLACK-FISH**.

**TAUTOLOGY** (from the Greek *tauto*, the same, and *logos*, speech), the repetition of the same sense in different words or phrases, when such repetition constitutes a blemish of style. See **PLEONASM**.

**TAVERNIER**, JEAN BAPTISTE, Baron d'Aubonne, was the son of a Dutch merchant settled at Paris, who traded largely in charts and maps, the perusal of which first inspired his son with a propensity for travelling. He was born at Paris about 1605, and before his twenty-first year had already visited a considerable portion of Europe. He subsequently travelled through Turkey, Persia, and other eastern countries, six times by different routes, trading as a diamond merchant at the same time that he indulged his thirst for making himself acquainted with the manners and customs of remote nations. Of these his journeys he gave an account, with the assistance of a literary friend. In 1669, having realized a large fortune, and obtained a patent of nobility from the French king, he retired to the estate of Aubonne, which he purchased, in the Genevese territories, with the view of passing the remainder of his life in tranquillity. The misconduct of a nephew, by injuring his pecuniary resources, altered his determination, and he was preparing to start once more for the East, for the purpose of recruiting his shattered finances, when he was suddenly overtaken by death at Copenhagen (not at Moscow, as is often stated, according to the *Biographie Générale*) in 1689. His travels (*Voyages en Turquie, en Perse, et aux Indes*), of

which there are translations in English (1678 and 1684), Dutch (1682), and German (1684, folio), have gone through several editions in the original French.

**TAVISTOCK**, a market town in England, in the county of Devon, in the picturesque valley of the Tavy, 11 miles north of Plymouth. It stands partly on the rocky sides and partly at the bottom of the vale. It has two handsome churches, and various places of worship for several dissenting bodies; a free school, occupying a new and handsome building; various other schools, a literary and scientific institution, a library, the remains of a celebrated monastery, a workhouse, &c. There are copper-mines in the vicinity, and lead, tin, manganese, arsenic, and iron are abundant in the district; some trade in farm produce is carried on. Sir Francis Drake was a native of Tavistock. It ceased to be a parliamentary borough in 1885. Pop. (1891), 5043; (1901), 4728.

**TAVOY**, a town in Lower Burmah, Tenasserim, division, on the river of the same name, 35 miles from its mouth, 230 miles south-east of Rangoon. It lies in a low situation, which, during the rainy season, becomes almost a swamp. It is laid out in straight streets, and the houses are mostly built of timber and thatched with palm leaves. The trade is inconsiderable. Near the town a mass of native loadstone occurs, and at a short distance from it is a hill entirely composed of specular iron ore. Pop. in 1891, 15,000. The town of Tavoy gives its name to an executive district, which, at the same date, had a pop. of 94,900 the area being 7150 sq. miles.—There is also an Island of Tavoy, the largest and most northern of the extensive chain which is called the Mergui or Tenasserim Archipelago. It is about 18 miles long and 2 broad, and its southern part is surrounded by numerous shoals and small islands, which make the navigation dangerous. On the eastern side there is a good and well-sheltered harbour, which has received the name of Port Owen.

**TAXES, TAXATION**. Taxes consist of that portion of their property which the government of a state exacts, for the supply of the public necessities, from its subjects, or other persons residing in the country and partaking of its advantages. Hence they form a part of the state revenues. Another part is formed by the revenues from the domains, and from the royal prerogatives, so far as the last afford only official gains, and are not used at the same time as means to exact or to raise taxes. See article **DOMAIN**.

Adam Smith has laid down four principles of taxation, which have been generally accepted by subsequent political economists. These are:—

1. The subjects of every state ought to contribute to the support of the government as nearly as possible in proportion to their respective abilities.
2. The tax ought to be certain, not arbitrary.
3. Every tax ought to be levied at the time or in the manner most convenient for the contributor.
4. Every tax ought to be so contrived as both to take out and keep out of the pockets of the people as little as possible over and above what it brings into the public treasury of the state.

But it is one thing to lay down general maxims for the guidance of legislators in the imposition of taxes and another thing to discover a mode of taxation which will not be open to objection on the ground of violating one or other of these maxims; and even in countries where the most enlightened principles of finance are followed, it will generally be found that all these maxims are violated in some way or other. Special circumstances have to be taken into account with regard to every tax that can be proposed, and the policy of imposing one tax instead of another depends upon the balance of advantages and disadvantages, and often to a greater or less extent on

considerations of convenience and sentiment. It is obvious that two of the maxims above stated, that which requires the tax to be proportioned to the abilities of the payer, and that which says it should be levied at the time or in the manner most convenient for him, cannot in all cases be strictly adhered to, simply because the state has not the means of doing so; and although it is easier to attend to the other two maxims, there may, in certain cases, be advantages connected with certain modes of taxation in which it is impossible to attend to them, such as to counterbalance the objections grounded on their violation. Thus the second maxim, forbidding arbitrariness and uncertainty in taxation, the violation of which is, as a rule, more objectionable than the violation of any of the other maxims, is to some extent infringed by the income-tax in this country; for in levying that tax it is found necessary to give to the commissioners powers of arbitrary assessment in cases where they think that the person assessed has not stated the true amount of his income.

The first of the maxims of Adam Smith regarding taxation, as given above, is not stated in full as it is to be found in the original. Adam Smith appends to it an explanatory clause, to the effect that by taxation proportioned to the respective abilities of the contributors he means taxation proportioned to the revenue which they enjoy under the protection of the state. It is contended by some, however, that a person's expenditure is a better criterion to follow in apportioning taxation than his income, as being a truer indication of his ability to pay. The justification of this view is that some, from the circumstances in which they are placed, and from the nature of their income, are obliged to save more of it than others, while some are under no necessity of saving at all. If a person's income depends on his continuing in sufficient health and strength to perform the duties in virtue of which his income is gained, that person having to make provision not only, it may be, for children or others dependent upon him, but also for old age, will have really less disposable means than another having an income of the same amount, but secured to him for his whole life; and both of these will probably have less disposable means than a person whose income (though still the same in amount) is continued to his successors. If, then, all these persons are taxed to the same amount, it may reasonably be maintained that they are not taxed in the ratio of their abilities. This will appear more clearly when it is considered that the person whose income is continued to his successors has in effect his income restricted in order that provision may be made for his successors. The person who lays out his money so as to obtain a permanent return for it gets a smaller income by it than if he had purchased an annuity with it, and it is upon this smaller income that he is taxed when taxation is proportioned to income; while a person who limits his disposable means in another way with a similar object is taxed upon his whole income, and not only upon that portion which he reserves for his own use. If it is fair, then (as of course it is), to make allowance for the limitation of income in the one case, it would seem to be equally fair to make allowance for the limitation of the enjoyed income in the other case, and the only effectual way of doing this would be to make taxation proportioned to expenditure, if that were practicable. But the truth is that it is not practicable accurately to adjust taxation either to income or to expenditure. Most taxes are actually on expenditure, but they are only roughly proportioned to it. But before we go on to speak of taxes actually in use we must notice another interpretation put upon Adam Smith's maxim that the subjects of a state should be taxed in proportion to

their abilities. It has been argued that a person enjoying a large income amply sufficing for all ordinary wants is more able to give up a certain proportion of that income than a person with a small income, and that therefore the former should have a larger proportion of his income deducted for the behoof of the state than the latter; that, in short, taxation should be graduated, and a larger per centage levied upon a larger income. This theory has been advocated, both in England and on the Continent; but it is a sufficient refutation of it that taxation based upon it would operate as a discouragement to industry.

Taxes are usually divided into direct and indirect. By direct taxes are understood such as are laid immediately on the consumers, as the carriage, horse, and dog taxes, legacy duties, stamp duties, &c.; by indirect taxes, such as are assessed on others in advance, who are left to remunerate themselves from the rest of the community, as the customs and most of the excise duties.

The most important of the direct taxes are the income-tax, which is, of course, a tax upon income, and the house-tax, which is a tax on expenditure. In theory the income-tax is one of the most equitable of taxes, inasmuch as it is intended to bear equally on all in proportion to their revenue, which is Adam Smith's first maxim of taxation. In practice, however, there are so many objections to it that many economists agree in condemning it, or at least in disapproving of its use as a regular source of income. The chief ground of objection to it is the impossibility of assessing it fairly. Those who have fixed incomes in the form of rent, interest, or salary cannot escape from paying their full share of the tax, since their incomes can always be ascertained. But it is different with those whose incomes consist in the profits of trade or professional emoluments. In their case there is no security for the accuracy of the returns made by them, and the dishonest among them are thus enabled to throw part of the burden that should be borne by them upon those who are in different circumstances or are more conscientious, which latter result especially is one of the worst features that a tax can have. The last remedy against this dishonesty is what has been already mentioned as an objection to the tax, namely, the intrusting of arbitrary powers of assessment to the collectors. The exercise of this discretion must not only be a very ineffectual remedy against the evil aimed at, but is not unlikely to lead in many cases to injustice. A person engaged in trade is often unable to say himself what his income really is, and that being the case it is perfectly obvious that the grounds on which the commissioners fix the amount of income to be assessed, when they fancy that the returns received by them are incorrect, must be very insufficient. This tax has further always excited a good deal of discontent in Great Britain on account of its inquisitorial nature. But even if a tax having all the objectionable qualities that are charged against the income tax is to be retained, it is contended by some, on such grounds as have been already indicated for taking expenditure rather than income as the true criterion of ability to pay, that the tax should be on expenditure and not upon income. The objection to this proposal is that not only would such a tax have all the disadvantages of the income-tax, but that a person might conceal his real expenditure by saving with the one hand and running into debt with the other. (See INCOME-TAX.) Some of the Australian colonies levy a direct tax on the market value of land apart from buildings and improvements, and a similar tax is advocated by many in Britain. The 'single-taxers', followers of the late Henry George, propose to replace all other taxes by one of this nature up to 20s. per pound.



In Great Britain house taxes are the means of raising a large part of the local revenues. Municipal revenues are indeed raised entirely in this way. The tax is not meant as a duty on a particular form of expenditure, but the house in which a person lives is taken as affording one of the best indications of his means, and it is assumed, therefore, that taxes proportioned to his house-rent will be proportioned to his abilities.

Indirect taxes are all on expenditure. When they are imposed on goods at the time of their importation they are denominated customs; when they are imposed on articles of inland production they are called excise duties. Adam Smith mentions one objection to this mode of raising revenue, as the payer of the tax must enhance the price of his goods, not only by the amount of the duty advanced by him, but also for interest, profit, and guarantee of that amount, so that the consumer must, in fact, pay more than the tax. Such taxes thus violate his fourth maxim, in taking out of the pockets of the people considerably more than they bring into the public treasury of the state. On the other hand they are recommended by the fact that they are likely to answer admirably the requirements of the third maxim, in being levied at the time and in the manner most convenient for the contributor. For the tax is paid in instalments by the consumer when he buys what he wants of the article taxed, which is no doubt the time when it is most convenient for him to do so, and he pays it in such a manner that the fact that he is paying a tax drops out of consideration. This latter recommendation is of course only founded on the feeling of the payer, and this feeling depends to a great extent on his ignorance and thoughtlessness, and will tend to disappear when the contributor becomes more enlightened. At present, however, it forms without doubt a powerful inducement in favour of this mode of taxation. There is one class of indirect taxes that are considered particularly objectionable by most political economists in Great Britain at least, namely all those which come under the designation of discriminating, including protective duties. Discriminating duties are such as put a tax on commodities produced in a certain way or under certain circumstances (in foreign countries instead of at home for example), and leave the same commodities untaxed when produced in another way or under other circumstances. In the first case, if the methods of production are equally good the tax has no particularly injurious effect. But it usually happens that one method is better than the other, and if government imposes on the superior method (that which produces a better quality of the commodity, or an equal quality with less labour) a tax sufficient to bring about the adoption of the other method, it is obvious that the only result will be to make the consumer pay more for that commodity, without in any degree enriching the state. If the tax should be laid upon the inferior method of production it would, of course, have no effect whatever. In the second case, where commodities imported from foreign countries are subjected to customs duties without equal excise duties being imposed on those of home production, the result is that the price of the commodity generally is increased, but whereas that part of the increase which is paid on the commodities of foreign origin comes into the public treasury, the other part, which is paid on those of home production, goes into the pockets of the producers. When the tax on foreign commodities of a kind that are also produced at home is of such an amount as to operate as a protective duty the result is still worse. The community generally pay more for what they want of such commodities without the public revenue obtaining any direct benefit. The

commercial legislation of Great Britain from 1846 has been based on the principle of having no discriminating duties of this nature or protective duties of any kind, that is, on the principle of free-trade; but the corn duty of 1902 may be called a partial return to protection, though the duty is so small as to have little or no protective effect, and is really intended for revenue purposes only. (See FREE-TRADE AND CORN-LAWS.) The high duties levied on intoxicating liquors are justified on the ground that these are mere articles of luxury, and that the high duty tends to check over-indulgence. On the whole subject of taxation see the works on political economy generally; some of the most important of these are mentioned at the end of our article under that heading.

It cannot be made a question among a free people to whom the right of taxation belongs. In Britain and America the principle has long been acknowledged that taxes are a voluntary donation from the people to the government.

**TAXIDERMY**, the art of preparing the skin and other parts of animals in such a way as to preserve their natural appearance and to fit them for being kept in a natural history collection. The skins of animals are the chief subject of taxidermy, whence the name (from the Greek *taxis*, arrangement, and *derma*, skin). The usual method of preparing skins is to rub them, after they have been completely deprived of flesh, with some composition in which arsenic is a principal ingredient. Sometimes alum and sometimes tanner's liquor are used for the purpose.

**TAXING OF COSTS**, the settlement of the amount due by a client to his attorney or solicitor for his legal services. An attorney is not allowed to make what charges he pleases, the rate of charges being fixed within certain limits by the court, in connection with which there is an officer, called in England a taxing-master and sometimes a registrar, and in Scotland an auditor, whose duty is to fix the amount of the costs when the client is dissatisfied with the charges of his attorney. There is an appeal from the decision of the taxing-master to the court itself, but the award of the latter is final. If the bill of costs rendered by an attorney and subjected to revision by the taxing-master is deemed to exceed the proper scale by more than one-sixth the attorney is held liable for the expense of taxing, but if not this falls upon the client.

**TAY**, a large river in Scotland, in the county of Perth, formed by two head-streams, the one issuing from the north-east end of Loch Tay, and the other from Loch Lyon, a small lake on the borders of Argyleshire. The two streams unite about 2 miles north-east of Loch Tay, whence the river flows past Aberfeldy, Dunkeld, and Perth, at which last town it widens out into an estuary from 1 to 3 miles in breadth, separating the counties of Perth and Forfar on the north from Fife on the south. The whole length is 120 miles, and the area of basin 2250 sq. miles. Vessels of 500 tons ascend to Newburgh, and those drawing 9 feet to Perth. Its principal tributaries are the Tummel (with the Garry) and Isla (with the Erich) on the left, and the Bran, Almond, and Earn on the right. During the upper part of its course the Tay flows with a rapid current through a wild and highly romantic country, and subsequently, after entering Strathmore, through the richest and finest valley in Scotland. In the summer of 1878 a railway bridge spanning the estuary of the Tay at Dundee was opened for traffic, but on the 28th of December, 1879, thirteen spans of it, crossing the navigable part of the river, were blown down in a violent storm, a passenger train,

which then happened to be crossing, being precipitated at the same time into the river. A second bridge, 2 miles 73 yards long, with 85 spans, and carrying two lines of rail, was opened in 1887.

TAY, LOON, a loch in the county of Perth, is a picturesque sheet of water 15 miles long and about 1 mile broad; receiving at its south-west end (near Killin) the Lochay and the Dochart, and discharging at its north-east end at Kenmore by the Tay. It is 100 to 600 feet deep, and is well supplied with fish. On its north-west shore rises Ben Lawers.

TAYLOR, BROOK, an English mathematician, born at Edmonton in 1685; died December 29, 1731. In 1701 he entered St. John's College, Cambridge. In 1709 he received the degree of LL.B., and in 1714 that of LL.D. In 1712 he had been chosen a fellow of the Royal Society, and in January, 1714, had been appointed its secretary. This office he retained till 1718, when he resigned it on account of the weak state of his health. Between 1716 and 1721 he paid three visits to the Continent. On the occasion of his first visit he made the acquaintance of Lord Bolingbroke, with whom he ever afterwards kept up an intimacy. The most important of Taylor's works was published at London in 1715, and bears the title *Methodus Incrementorum Directa et Inversa*. It contains, among other theorems of less consequence, a celebrated one, which is hence called Taylor's theorem, the importance of which was first recognized by Lagrange, who proposed to make it the foundation of the differential calculus. His other works include two treatises on linear perspective, besides contributions to the *Philosophical Transactions*.

TAYLOR, ISAAC, an English thinker, born at Lavenham, Suffolk, in August, 1787; died at Stamford Rivers, June 28, 1865. His life was almost entirely passed in studious retirement at the place where he died. His first published work is entitled *Elements of Thought* (London, 1823). It was succeeded by numerous others, most of which are of a partly philosophical, partly religious cast. The principal are, *The Natural History of Enthusiasm* (1829), *The Natural History of Fanaticism* (1833), *Spiritual Despotism* (1835), *Physical Theory of Another Life* (1836), *Ancient Christianity* (1839-43), *Loyola and Jemitism* (1849), *Wesley and Methodism* (1851), *Restoration of Belief* (1855), *World of Mind* (1857), *Ultimate Civilization* (1860), and *Spirit of Hebrew Poetry* (1861). The first of these works is that by which his name is chiefly known, although it was originally published anonymously. The work on ancient Christianity was composed with the view of correcting the errors which the author believed many were likely to fall into in consequence of the appeals of the writers of the Oxford tracts to the authority and practice of the early church.

TAYLOR, JEREMY, an eminent divine and prelate of the Irish Church, was born in the year 1613, at Cambridge, where his father was a barber. He was educated at Perse's Free School in his native place, and entered, in 1626, a sizar in Caius College, where he continued until he had graduated Master of Arts. Entering into orders he occasionally lectured for a friend at St. Paul's Cathedral, where he attracted the attention of Archbishop Laud, who procured him a fellowship of All Souls College, Oxford. In 1638 he was presented by Bishop Juxon to the rectory of Uppingham, in Rutlandshire. In 1642 he was created Doctor of Divinity at Oxford, at which time he was chaplain in ordinary to Charles I. In the same year his living was sequestered by the Parliament. After the outbreak of the civil war he continued to attend Charles as chaplain, and when the parliamentary party proved victorious he was frequently imprisoned for short periods. Eventually he retired into Wales,

where he was kindly received by the Earl of Carbery, under whose protection he was allowed to exercise his ministry and keep a school. In this obscure situation he wrote those copious and fervent discourses, whose fertility of composition, eloquence of expression, and comprehensiveness of thought have rendered him one of the first writers in the English language. The death of three sons within a short period rendered a change of place necessary for the restoration of his tranquillity, and he removed to London and officiated, not without danger, to private congregations of Royalists. At length, in 1658, he accepted an invitation from Lord Conway to reside at his seat in Ireland, where he remained until the Restoration, when he was elevated to the Irish see of Down and Connor, with the administration of that of Dro-more. To this office he was consecrated in January, 1661. He was also, in the same year, made a privy-councillor for Ireland, and chosen Vice-chancellor of the University of Dublin. He conducted himself, on his advancement, with all the attention to his duties, public and private, which had ever distinguished him in humble situations. He died at Lisburn, August 13, 1667. Taylor possessed the advantages of a comely person and a melodious voice, which were further set off by the most urbane manners and agreeable conversation. His works have been often printed in a variety of forms. A great part of them consists in sermons and devotional pieces. There are likewise several treatises, one of the most remarkable of which is entitled *A Discourse of the Liberty of Prophecy* (Preaching), 4to, 1647, which pleads eloquently and strenuously for liberty of conscience. Of the other writings of this prelate the most generally known are his *Golden Grove*, or *Manual of Daily Prayers*; his treatises on *Holy Living* and *Holy Dying*; and his *Ductor Dubitantium*, or *Rule of Conscience*, a casuistical treatise. An edition of his works, with a life, by Bishop Heber, was published in 1822 (fifteen volumes); but the best edition is that of the Rev. C. P. Eden, M.A., Fellow of Oriel College, Oxford (London, ten vols. 1854).

TAYLOR, JOHN, usually called the *water-poet*, from his being a waterman, was born in Gloucester, about 1580. He was taken young to London, and apprenticed to a waterman. He was at the taking of Cadiz, under the Earl of Essex, in 1596, and afterwards visited Germany and Scotland. At home he was many years collector, for the lieutenant of the Tower of London, of his fees of the wines from all the ships which brought them up the Thames. When the civil wars broke out he retired to Oxford, where he kept a common victualling house, and wrote pasquinades upon the Roundheads. He afterwards kept a public-house at Westminster. He died in 1654, aged seventy-four. Certain of his works are published under the title of *All the Works of John Taylor, the Water-Poet*, being Sixty and Three in Number, collected into one volume by the author, with sundry new Additions, corrected, revised, and newly imprinted (1630, folio). His pieces were subsequently increased to more than double that number. These pieces are not destitute of natural humour, and of the jingling wit which prevailed so much during the reign of James I.

TAYLOR INSTITUTION, an institution in connection with Oxford University, designed mainly for the promotion of the study of modern European languages. It owes its foundation to a bequest of Sir Robert Taylor, and the building belonging to it was erected in 1848 from this bequest. The institution comprises four professorships of modern European languages and a library, and there are in connection with it a scholarship and an exhibition. It is under the management of nine curators, all of whom must

be members of convocation. The library is open free to all members of the university, and other literary persons may be admitted by special permission. The curators of the institution have also the administration of a fund bequeathed by William Thomas Horner for the encouragement of the study of the Polish and other Slavonic languages.

**TAYLOR'S THEOREM**, an important theorem of the differential calculus, which is expressed by the equation—

$$f(x+h) = f(x) + hf'(x) + \frac{h^2}{1 \cdot 2} f''(x) + \frac{h^3}{1 \cdot 2 \cdot 3} f'''(x) + \dots + \frac{h^n}{n} \frac{d^n f(x)}{dx^n}.$$

This theorem was discovered by Dr. Brook Taylor, and was first published in 1715.

**TAYPORT**, formerly called *Ferryport-on-Craig*, a town of Scotland, in Fifeshire, on the Firth of Tay, opposite Broughty Ferry, with a parish church, two United Free churches, a Baptist chapel, linen and jute factories, a foundry, a timber-yard, salmon-fishing, mussel-dredging, &c. A dock and pier have been constructed by the N.B. Railway Company, and the town is partly a residential suburb of Dundee. Pop. (1891), 2871; (1901), 3314.

**TOHAD** (in the Bornou language 'Great Water'), a fresh-water lake in the interior of Africa. It lies between Bornou on the west and south, Kanem on the north and east, and Baghirmi on the south. Its length from north to south is about 150 miles, and its breadth about 125; but it is only during the rainy season that the whole of the area included within these limits is covered with water. During the dry season a large expanse is converted into marsh, and the open water is of comparatively limited extent. Its principal feeder is the Shari from the south. It has no permanent outlet. Infusoria and fish are abundant in it, and its surface is to a large extent covered with lotus and other water-plants. The marshy shores bear a great deal of papyrus, and swarm with mosquitoes, ants, termites, scorpions, turtles, lizards, crocodiles, antelopes, wild boars, buffaloes, elephants, and hippopotami. The inhabitants on the north-east side of the lake and of the islands in the lake (of which there are several) are called Biddumas. They are well-made and active, with jet-black or dark-brown complexion, and regular features. Some of the islands are densely peopled, having a large village to nearly every square mile. The lake is now bounded on the north-west, north, east, and south-east by French territory, on the south by the German Kamerun, and on the west by the British Nigeria.

**TOHERKASK**. See **CHEKASK**.

**TOHERNIGOV**. See **CZERNIGOV**.

**TOHERNY**. See **CZERNY**.

**TCHUDSKO LAKE**. See **PEIPUS**.

**TEA** (*Thea*), a most important plant belonging to the natural order Ternstroemiaceæ or Camelliaceæ. It is a branching evergreen shrub that attains the height of about 30 feet. The leaves are alternate, oval-oblong, serrated, of a dark glossy-green colour and firm texture. The flowers are solitary or in pairs, disposed in the axils of the leaves; the corolla is white or yellowish, and composed usually of five petals; fruit a woody three-celled loculicidal capsule, only one ovule in each cell forming a ripe seed. The tea-plant is a native of China and Assam, and has been cultivated and in common use in the former country from the most remote antiquity. Tea was hardly known in Europe before the middle of the seventeenth century, but has now become an article of such commercial importance in this portion of the globe as to employ a large amount of shipping and a correspondingly large amount of capital. Still, so vast is the home consumption, that it is alleged, that were

Europeans to abandon the commerce altogether, the price would not be much diminished in China. It appears to be cultivated in all parts of China, even in the vicinity of Peking. It succeeds best in south exposures and in the neighbourhood of running water. As the seeds are very apt to spoil, and scarcely one in five will germinate, it is usual to plant several in the same hole, at the depth of 4 or 5 inches. The plants require little further care than that of removing the weeds, till the third year, when the leaves may be gathered. In seven years the plants have attained the height of 6 feet; but as they bear few leaves they are trimmed down, which process produces a great number of new leaves. The leaves are plucked off one by one with many precautions. In a district in Japan where the tea-plant is cultivated with peculiar care, the first gathering takes place at the end of the winter, when the leaves are young and tender and are only a few days old; these, on account of their scarcity and dearness, are reserved for the wealthy, and called *imperial tea*. The second gathering is at the beginning of spring, when some leaves have attained their full size and others are only expanding; all are gathered promiscuously and afterwards sorted; the youngest especially are separated with great care, and often sold for the imperial. The third and last gathering takes place towards the middle of summer; the leaves are now fully expanded, of inferior quality, and are reserved for the common people. Similar successive gatherings are also practised in China and elsewhere.

There is probably only one true species, *Thea chinensis*, but several varieties, *T. viridis*, *T. bohea*, and *T. assamica*, have been regarded as distinct species. Formerly it was thought that green tea was gathered exclusively from *T. viridis* and black tea from *T. bohea*; but Mr. Fortune and others have proved that both black and green teas may be made indifferently from either, the differences between them depending partly upon the variety of the plant from which the leaves have been obtained, but more particularly upon the time of gathering and mode of preparation. Thus, green teas are generally prepared by drying the leaves as quickly as possible after they are gathered, then slightly heating them, after which they are rolled separately or in small heaps, and then rapidly dried; while black tea is made from the leaves which, after being gathered, are exposed to the air for some time, and then, after having been tossed about, are placed in heaps, where they undergo a kind of fermentation; after which they are exposed to a fire for a short time, then rolled in masses to get rid of the moisture and to give them a twisted character; then they are again exposed to the air, and finally dried slowly over a fire. Much of the green tea exported from China to Britain, America, and other foreign countries was formerly coloured artificially with a mixture of Prussian blue, turmeric, and gypsum. The leaves, being gathered, are cured in houses which contain from five to ten or twenty small furnaces, about 3 feet high, each having at the top a large flat iron pan. There is also a long, low table, covered with mats, on which the leaves are laid and rolled by workmen who sit round it. The iron pan being heated to a certain degree by a little fire made in the furnace underneath, a few pounds of the fresh-gathered leaves are put upon the pan: the fresh and juicy leaves crack when they touch the pan; and it is the business of the operator to shift them as quickly as possible with his bare hands till they become too hot to be easily endured. At this instant he takes off the leaves with a kind of shovel resembling a fan, and pours them on the mats; other operators, now taking small quantities at a time, roll them in the





palm of their hands in one direction, while a third set are fanning them, that they may cool the more speedily, and retain their curl the longer. This process is repeated two or three times, or oftener, before the tea is put into the stores, in order that all the moisture may be thoroughly dissipated and their curl more completely preserved. On every repetition the pan is less heated, and the operation performed more closely and cautiously. The tea is then separated into the different kinds, and deposited in the store for domestic use or exportation. The different sorts of black and green arise not merely from soil, situation, or the age of the leaf; but after winnowing the tea the leaves are taken up in succession as they fall; those nearest the machine, being the heaviest, are the *gunpowder tea*; the lightest, the worst, is chiefly used by the lower classes. That which is brought down to Canton then undergoes a second roasting, winnowing, packing, &c., and many hundred women are employed for these purposes. In India and Ceylon machinery is extensively used in the manufacture of tea in order to secure greater uniformity and cleanliness. Indian methods also differ somewhat from China in other respects, especially in the making of black teas. The Ceylon methods of manufacture are generally similar to those used in India.

Among the most important of other plants used to make tea or similar infusions are the maté of Paraguay (*Ilex paraguayensis*), a kind of holly; the coffee-plant; species of *Ledum*, yielding Labrador tea; *Catha edulis*, yielding Abyssinian tea, also known as *kdt*; the orchid *Angrecum fragrans*, of Mauritius, yielding faham tea; several kinds of myrtles, &c.

The black teas usually imported by Europeans and Americans, are, beginning with the lowest qualities, *bohea*, *congou*, *campo*, *souchong*, *pouchong*, *Assam pekoe*, *pekoe*; the green teas are *twankay*, *hyson skin*, *young hyson*, *hyson*, *imperial*, and *gunpowder*. The best tea grown in China is cultivated in the province of Kiangsu, that beautiful province of which Nanking is the capital, and which produces an abundance of every necessary and luxury; but the greatest part of the common black teas exported to Europe comes from Fokien and Quangtung. The Russians, however, who carry on the overland trade in tea, derive their supplies from other localities. The superiority of the tea brought into the European market by the Russians does not depend on its not having been exposed to a sea voyage (commonly supposed in England to be injurious to the flavour of the herb), but entirely on the greater fitness or excellence of the soil, &c., in the districts from which the Russians draw their teas.

The chemical composition of tea varies with many circumstances, such as the age of the leaf, the method and conditions of growth, the colour, &c. The principal constituents are theine, tannin, ash, and essential oil. Black tea generally has more theine, less tannin, and less essential oil than green. One analyst gives the average composition of a China green tea as: theine, 2.02 per cent; tannin, 14.57; ash, 7.38; insoluble leaf, 47.05; moisture, 6.43; and the same authority gives the average composition of six Indian teas as follows: theine, 2.7 per cent; tannin, 14.87; ash, 5.82; insoluble leaf, 51.24; moisture, 5.81.

Tea owes its chief properties to the presence of the volatile oil, tannin, and especially the alkaloid named *theine* ( $C_8H_{10}N_2O_2$ ), which is in its constitution identical with *caffeine* (contained in coffee) and occurs also in guarana, Paraguay tea or maté, and kola nuts. Theine can be prepared in the form of silky needles. The effects of tea on the human system are those of a very mild narcotic, and, like those

of any other narcotic taken in small quantities, exhilarating. The green teas possess this quality in a much higher degree than the black, and a strong infusion of the former will in most constitutions produce considerable excitement and wakefulness. Of all narcotics, however, tea is the least pernicious, if indeed it be so in any degree—except when drunk to excess, or in the case of certain constitutions. It acts likewise as a diuretic and a diaphoretic, and assists digestion.

Tea is subjected to extensive adulteration, but former methods are now little used. The substances used for this purpose were chiefly mineral matter, for increasing weight; organic matter, for increasing weight; substances intended to impart fictitious strength, and colouring substances. Under the first of these classes ferric oxide and siliceous matter were the most generally employed. The second class of adulterants includes exhausted tea-leaves and foreign leaves; the third class includes added tannin, lie-tea, soluble iron salts, and alkaline carbonates. Lie-tea consists of tea-dust mixed with gum or starch, and sometimes mineral matter. The principal colouring matters were indigo, turmeric, and Prussian blue.

Some of the attempts to cultivate the tea-plant in foreign countries have met with no little success. Within recent times considerable efforts have been made by the Dutch government of Java to produce tea in that island with the assistance of Chinese cultivators, and tea is now exported. The British possessions in India now yield large supplies of tea, especially Assam. It is the produce of a native variety of plant, the *Thea assamica*, as well as of hybrids with the Chinese plant. Chinese tea manufacturers have been induced to settle in Assam, notwithstanding the jealousy of their native government. The tea-shrubs in Assam are said to thrive in the valleys between the jungles and on the banks of running streams, whereas in China the plants rather affect the sides of hills. Indian growers have been charged with attending more to quantity than to quality. Tea cultivation has developed very rapidly in Ceylon since 1873. (See CEYLON.) Natal also produces some tea.

It has been said that the use of tea among the Chinese is not of ancient date, from the character representing tea not being found in any ancient Chinese work. If this be true it is but negative evidence, and it would require vast research and a close acquaintance with Chinese literature to prove that it is true. We have, however, positive evidence of its being used as early as the eighth and ninth centuries. A tax on tea is mentioned in the Annals of the Dynasty of Tang; and in the Journal of an Arabian merchant who traded with the Chinese at that early period mention is made of the infusion of an herb named *sah*, much drunk by the inhabitants. This herb is evidently tea, and its name *sah* is as near an approximation to the Chinese name *chah* as the Arabic alphabet is capable of expressing.

It may be interesting to trace the gradual increase in the use of tea in Britain from the time when it was first tasted as a curiosity to the present period. The first time we find it mentioned in this country is in an act of Parliament passed in 1660, by which we find it charged with a duty of 1s. 6d. per gallon when drunk in public-houses. In the following year Pepys speaks of it in his Diary in the following terms:—"September 25. I sent for a cup of tea (a Chinese drink), of which I had never drank before." In 1664 a present of 2 lbs. 2 ozs. of tea was made by the East India Company to Charles II. The price was then about two guineas per lb., and the tea appears to have been procured from the Continent, as the first importation by the Company was in 1669, when two canisters were received by them,

containing 150 lbs. It appears, however, to have been hardly considered as an article of commerce, the first order for tea being sent to Madras. The singular terms of this order will show how recent was the introduction of the herb, and the estimation in which it was held:—'In regard tea is grown to be a commodity here, and we have occasion to make presents thereof to our great friends at court, we would have you yearly send us five or six canisters of the very best and freshest; that which colours the water in which it is infused most of a greenish complexion is best esteemed'. In the year 1678 nearly 5000 lbs. were imported; this quantity, which would now be sold at one large shop in London, appears to have overstocked the country, for we find only 410 lbs. imported altogether in the six following years, but after this time the demand for tea slowly increased. Our ancestors gradually acquired a preference for the social and exhilarating beverage over the heady ale which accompanied their former repasts, and about the end of the century nearly 20,000 lbs. of tea were brought every year to England. In twenty years from this time the annual importation reached above 1,000,000 lbs., being an increase of fiftyfold in twenty years. Henceforward the consumption of tea, almost without fluctuation, increased to its present enormous amount, the increase being doubtless assisted by the steady reduction of the duty. A considerable increase in the exportation of this commodity from China took place more especially after the opening of many Chinese ports by the Treaty of Nanking in 1842, and the Treaties of Tientsin in 1858 and 1860. The following table shows the amount of tea imported into the United Kingdom and the amount re-exported in several years from 1873 till 1901:—

	Lbs. Imported.	Lbs. Re-exported.
1873.....	162,344,395.....	30,322,240
1883.....	222,005,519.....	51,192,822
1889.....	221,002,000.....	35,981,060
1897.....	200,800,411.....	37,354,723
1900.....	800,230,857.....	43,067,884
1901.....	295,264,142.....	43,389,518

The total value of the tea imported in 1901 was £9,440,374, and of that re-exported £1,698,694. Of the total imported in 1901, 160,102,670 lbs. came from India, 104,601,531 lbs. from Ceylon, and only 20,419,806 lbs. from China, including Hong-Kong and Macao. In 1873 China sent 133,307,196 lbs., the British East Indies 20,326,882 lbs., and Ceylon only 23 lbs. as a small beginning of her wonderful development in this respect. The re-exports of China tea go principally to Morocco, Holland, and Germany; of Indian tea, to Germany, Cape Colony, Canada, and the United States; of Ceylon tea, to Germany, United States, Canada, and Cape Colony. The Australians are the greatest tea-drinkers.

Russia and Holland are the only countries on the continent of Europe in which tea is extensively used as a popular beverage. A better quality of tea is used in Russia than almost anywhere else. Until 1862 the imports of tea into Russia were exclusively overland. It was conveyed from Kiachta to Tomsk, Irkutsk, Tjumen, or Perm, and thence to Nijnei-Novgorod, which is the great tea market for Russia. After that time the importation of tea by sea was permitted, and this greatly reduced the Kiachta tea trade, so that only the northern and eastern parts of Russia were supplied with tea from Kiachta, while the western and southern parts were supplied by sea. The great Siberian Railway now brings the Chinese tea to Russia. In Russia there is a large consumption of what is called *brick-tea*, so called from the fact of its being made up for sale in brick-shaped cakes. For this purpose the larger leaves and the

young shoots of the tea-plant are used. After being softened by steam they are pressed in wooden forms into shape, and are then laid out in layers in a place where they are protected from the sun, and in such a manner that currents of air may play freely about each of them. When quite dry they are wrapped separately in paper, and a red ticket bearing black Chinese characters is affixed to each brick. The bricks are as hard and sonorous as wood. Their ordinary size is about 8½ inches long, 4½ inches broad, and ½ inch thick. In colour brick-tea is either bright-green, dark-green, or nearly black. The bright-green is the best, and the black the worst, being made from the refuse of the tea destined for the European market. Among the Mongols these bricks are used as money.

**TEAK-TREE** (*Tectona grandis*), a tree belonging to the natural order Verbenaceæ, one of the largest and most useful of trees. It is found more than 200 feet high, and the stem, branches, and leaves are all very imposing. The trunk is erect and massive, the bark ash-coloured; the leaves are obovate and downy beneath, somewhat declining, on young trees from 1 to 2 feet long and 8 to 16 inches in breadth. The flowers are small, white, and fragrant, disposed in widely-spreading, terminal panicles. The calyx is tomentose, and the corolla hardly longer than the calyx. The fruit is a one-celled drupe. This tree abounds in the extensive forests of Java, Ceylon, Malabar, Coromandel, &c., but especially in Burma and Siam, from which countries Great Britain derives most of its supplies of this timber. The wood is light and easily worked, and at the same time strong and durable. It is considered superior to all others for ship-building, and is besides extensively used in the East in the construction of houses and temples. This tree was introduced into the British possessions in India by Lord Cornwallis, and is now planted with a view to timber in various parts of India. The leaves furnish a purple dye, which is employed for colouring cottons and silks. *African teak* is the wood of the Liberian tree *Oldfieldia africana*, of the natural order Gesneraceæ.

**TEAL**, a genus of Ducks, usually ranked with the Anatine or True Ducks, and distinguished as a genus (*Querquedula*) by the bill having a horny tip and being as long as the head. The second quill is the longest of the wings, and the nostrils are of oval shape, and placed at the base of the bill. The Common Teal (*Q. crecca*) is a well-known species, and is the smallest of British ducks. Whilst many teal sojourn throughout the year and breed in Great Britain, by far the greater number fly northwards for the summer and return to Britain for the winter. This bird arrives in Britain in September, and inhabits lakes and marshes. The nest is built of leaves and grasses, the eggs numbering from eight to ten, and being coloured a dirty or brownish white. The head is coloured chestnut-brown above, the sides being of greenish hue on their upper parts and rich brown below, the two colours being separated by streaks of buff colour. The chin is coloured black; the back is grayish-white, mottled with dark streaks; the wings exhibit brown and purplish hues; and the tail is of a blackish-brown tint. The females are coloured a general sombre brown. The length of these birds is about 15 inches. The Summer Teal or Garganey (*Q. circia*) is less common, its regular breeding-place being confined to Norfolk and Suffolk. The Chinese Teal or Mandarin Duck (*Aix galericulata*) has the bill shorter than the head, the horny tip being very large, and the edges straight. The toes possess a large web, and the second quill is the longest in the wings. These latter ducks perch on trees; and the males exhibit a highly variegated

plumage of green, purple, white, and chestnut, the females being coloured a more sober brown. The male loses his curious head-crest, wing-coverts, and brilliant plumage from May to August, and assumes a plumage resembling that of the female. The young are covered above with a soft down of brownish hue. The eggs are coloured brown.

**TEASEL**, a genus of plants, forming the type of the natural order Dipsacaceæ or Dipsacacæ. The plants of this order are herbs or under-shrubs, with opposite or verticillate leaves; flowers in dense heads, surrounded by an involucre; corolla tubular, monopetalous; stamens four, epipetalous; fruit dry, indehiscent. The cultivated species, *Dipsacus fullonum*, the fuller's teasel, has an herbaceous, upright, prickly stem; the leaves are connate, oval-lanceolate, and likewise prickly beneath on the principal nervures. The florets are blue, and expand successively by zones. It has been considered a variety of the wild teasel (*D. sylvestris*), a common plant in many parts of Europe; but it differs in having the scales or chaffs more rigid, recurved, and forming a little hook at the extremity. This conformation is peculiarly suitable for raising the nap upon woollen cloths, and for this purpose the heads are fixed round the circumference of a large broad wheel, which is made to turn round, and the cloth is held against them, or they are set into flat boards like cards. This plant is in consequence cultivated for manufacturing purposes, and has become an article of considerable importance. The seeds are sown in March in well prepared, strong, rich land, broadcast, and at the rate of 1 peck to the acre. They are hoed, like turnips, to a foot distance; and the second year, in August, the heads are fit to cut. They are sold by the bundle of twenty-five in each, and the ordinary produce is 160 of such bundles to the acre.

**TECHNICAL EDUCATION.** See article in SUPPLEMENT.

**TECHNOLOGY** (from *technê*, art, and *logos*, word, science) is the science which treats of the arts, particularly the mechanical. Technology may be divided into two kinds, a higher and lower, of which the latter treats of the various arts themselves, and their principles, their origin, history, improvement, &c.; the former, of the connection of the arts and trades with the political condition of a nation, and the important influence which they have exercised ever since the mechanical occupations have come to honour, that is, since the growth of free cities in the middle ages.

**TE DEUM LAUDAMUS**, or still more abbreviated, **TE DEUM**, is the beginning of the hymn of praise usually ascribed to St. Ambrose and St. Augustine, although it cannot be traced farther back than the end of the fifth century, while St. Augustine, the latter of the two mentioned, died in 430. The opening words, meaning 'We praise thee as God,' show that it was originally a hymn to Christ, but it is now always regarded as a hymn to the Father, the English version beginning, 'We praise thee, O God.' In the morning service of the Anglican Church either it or the Benedicite is always sung between the first and second lessons. It is often sung on particular occasions, as on the news of victories and on high festival days. Among the modern composers of this hymn are Haase, Naumann, Haydn, Danzi, Schicht, and Handel.

**TEES**, a river in England, which rises near Cross Fell, in Cumberland; and flowing south-east, and latterly north-east, marks the southern limit of the county of Durham, to its mouth in the North Sea, where it forms an estuary of considerable extent. Its whole course is between 70 and 80 miles. Stockton and Middlesbrough are both near its mouth.

**TEETH**, the name given to certain hard structures developed in Vertebrate animals, in connection with the skin or epidermic structures of the body, and thus included under the consideration of the *exoskeleton*. Teeth are developed from the *dermis* or true skin, forming what in comparative anatomy is named the *enderonic* layer of the skin. In lower or Invertebrate animals the term *teeth* is applied to structures of very different nature and form. Thus the horny structures developed in the mouth of the Leeches, or the structures found in the mouth of many higher Mollusca, may be named 'teeth,' although it is needless to remark the Invertebrata do not possess any structures analogous in a true sense with the teeth of Vertebrates. Amongst the latter very great variations are to be noted in the situation, implantation, form, structure, and number of the teeth. In man and higher Mammals two sets of teeth are developed: the early, *milk*, or *deciduous* teeth, and the permanent set. Such forms are therefore named *diphyodont*; whilst those in which one set only is developed are named *monophyodont*. In the Ant-eaters teeth are entirely wanting; and they are present in the embryonic condition of the Whale-bone Whales, but are totally wanting in the adults. The structure of the Mammalian teeth is made up mainly of dentine, or ivory, which consists of minute tubules embedded in a ground substance which is calcified. The part of the dentine projecting above the gum is covered with a cap of enamel, while the parts buried in the jaw are coated with a substance called *crusta petrosa*, almost identical with bone. In the centre of the tooth is the pulp cavity filled with a delicate connective tissue, containing vessels and nerves. The enamel is the hardest structure occurring in the human body, and consists of but 2 per cent of animal matter, the bulk of the substance being mineral. Each tooth admits of division into a crown, body, and root; and in man and mammals are lodged in *alveoli* or sockets. The crown of the tooth first appears in order of development; the parts lying above the growing tooth being absorbed, whilst the fangs are developed as the tooth rises from its socket. Each tooth is developed in a tooth-sac, the sac in which the permanent tooth is formed being simply a prolongation of that in which its predecessor of the milk set was developed. The milk or temporary teeth are gradually displaced from below by the upward growth of the permanent teeth, the fangs of the milk-teeth being absorbed, and the latter falling out as their successors are more fully developed. The milk set in man consists of twenty teeth; and numbers four incisors, two canines, and four premolars or bicusps in each jaw. The permanent set includes, in addition to the foregoing teeth, six true molars in each jaw—the latter being thus unrepresented in the milk set. The milk-teeth begin to appear about the sixth month of life, and continue to be developed till about the end of the second year. Each tooth sac contains and develops a little projection or *papilla* which soon assumes the shape of the future tooth. Limy matter is formed at the apex of the papilla, and proceeds downwards to the base, and in this manner the tooth is developed; the papilla itself in time appearing as the pulp-cavity of the tooth. The permanent teeth begin to appear about the sixth year of life; the first tooth to appear being the front molar of each side, whilst the last molars or wisdom-teeth are not usually developed until adult life has been attained. Man has thus thirty-two teeth in his permanent set—sixteen in each jaw. The incisors or front teeth are single-fanged, and have chisel-shaped crowns. To the incisors succeeds on each side the single canine tooth, which has also a single root and a more pointed



**crown.** The fourth and fifth teeth, premolars or bicusps, derive their latter name from the presence of two pointed cusps or tubercles on their crowns. The fourth tooth, or first premolar, shows a tendency to become double-fanged, whilst the fifth, or second premolar, is double-rooted, and the crowns of both are broad. The molars—three on each side of each jaw—have the broadest crowns of all, and possess each two or three fangs. The sixth upper molar is the largest tooth of the whole set. The upper incisor teeth in comparative anatomy are defined as those which are implanted in the pre-maxilla; the lower incisors being those which correspond with the upper incisors. Upper canines are the foremost teeth in the maxilla, and lower canines are the teeth which bite in front of the upper canines. The molars are defined as those teeth which are situated behind the last tooth which has a vertical predecessor. We express the dentition of any animal by a *dental formula*. That of man runs thus:—I.  $\frac{2}{1}$ :C.  $\frac{1}{1}$ :P.M.  $\frac{2}{2}$ :M.  $\frac{3}{3}$  = 32. This formula simply expresses that the incisors (I.) number two on each side of each jaw—the numbers above the horizontal line corresponding to the teeth in the upper jaw, those below the line indicating those of the lower jaw; whilst the further subdivision of the teeth above and below the line is meant to indicate the numbers in each side of each jaw respectively. The other signs and numbers therefore read that the canines, premolars, and molars number two, four, and six in each jaw; making a total of thirty-two teeth. Similarly if we wished to express the dental formula of a ruminant such as the sheep we would find that there were no upper incisors or canines, but six lower incisors and two lower canines; and that there were six molars and six premolars in each jaw. Such a formula would run thus:—I.  $\frac{0}{0}$ :C.  $\frac{0}{0}$ :P.M.  $\frac{3}{3}$ :M.  $\frac{3}{3}$  = 32.

Birds possess no teeth, but have the margins of the jaws sheathed with horn. Certain extinct birds (*Odontopteryx*, &c., Owen) appear, however, to have had tooth-like processes developed on their jaws. In reviewing the Reptiles we find that teeth may be borne on the palate as well as on the jaws; and in Fishes and Amphibians teeth may exist in two rows in each jaw (*Protodus*), and may also be borne on the back part of the mouth and on the skull (*Plethodon*); or even on the tongue (*Salmon*), gill-arches (*Perch*), pharyngeal bones (*Scarus*), sides of the mouth, and in other situations. Then also we find that, save in the Crocodiles, lower Vertebrates have the teeth fastened in various ways to the jaws, and not implanted in sockets as in Man. In fishes the teeth are usually attached to the surface of the structures which bear them by ligaments. In Sharks the teeth are placed in a common groove, whilst row after row may be developed in fishes as the front and older teeth are worn away or destroyed. In Crocodiles the new teeth are formed on the inner side of the old ones. In many Lizards (which see) teeth become ankylosed by bony union to the summit of the jaw—such animals being known as *Acrodonts*; or (as in other Lizards termed *Pleurodonts*) we may find the teeth attached by bony union to the outer side of the jaws. Teeth sometimes undergo great modifications, as in the poison-fangs of serpents, which represent greatly modified teeth, and which are grooved or channelled by a canal for the transmission of the poison-fluid. The teeth of the Rays (which see) form a mosaic-like pattern in the mouth. In the molars of the Elephants we see a complicated form of tooth-structure, consisting of a number of narrow cross plates of dentine, topped by enamel, the space between these plates being filled up by layers of cement. The dentine is variously folded and convo-

luted in the teeth of the Horse, Sheep, &c.; and a still more complicated pattern was exhibited in the extinct *Labyrinthodons* (which see). Actual compound teeth only occur in the *Orycteropus* or Cape Rat-eater; and an extraordinary disposition of the teeth occurs in the little egg-eating snake, the *Rachiodon* of Africa. This form has gullet or cesophageal teeth, consisting of processes which spring from the backbone and project into the gullet. The functions of these teeth are well seen when the animal swallows the eggs which are broken by these teeth; otherwise the serpent would lose much of its food were the eggs broken in the mouth by ordinary teeth. As regards the number of teeth which occur in Vertebrates, the greatest variation may be found to prevail. The Narwhal (which see) has but two teeth in its adult state; some Armadillos have ninety; and some Dolphins over 200. The Hag-fishes or Myxines have each but a single palatal tooth; the fish named *Ceratodus* has only two above and two below; whilst some eels (*Muraena*) and such fishes as the Pikes have immense numbers. Some teeth—such as the incisor tusks of the Elephants, or the incisors of the Rodents, continue to grow throughout life from a *permanent pulp*. In the latter the continuous growth is adapted to meet the equally constant attrition and wear experienced in the 'gnawing' operations of these animals.

**TEETH, ARTIFICIAL**, are either cut out of some natural substance such as bone or ivory, or moulded out of some manufactured composition. The best natural substance for artificial teeth is ivory, the only objection to which is that it gradually loses its colour. When a complete set is made of this or any similar material it is all made out of two pieces, one for the under and one for the upper jaw. These pieces are first cut out so as to resemble rows of teeth with all their natural irregularities, and when wanted for use have their bases fitted with all possible accuracy to the gums of the persons for whom they are intended. With this end impressions of the patient's gums are taken in bees'-wax or gutta-percha softened by heat, and plaster models afterwards taken from these impressions. When these operations are carefully performed these models are exact counterparts of the patient's gums, and it is by means of them that the bases of the teeth are shaped and trimmed. When a perfect fit is obtained the sets will lie quite firmly in their place without any other means being adopted to effect this. Teeth made of artificial compositions are moulded either separately or in sections, and are afterwards affixed to bases made of some other material. The commonest composition is a kind of porcelain, in the manufacture of which calcined and pulverized silice, felspar, and kaolin are chiefly used for the body of the teeth, some metallic oxide for a colouring matter, and a mixture of felspar and platina sponge for the enamel, which is applied to the surface by means of a flux of quartz, borax, and tartar. In making the body of the tooth the substances mentioned are mixed with water into a putty-like mass, which is then put into a brass mould which is about one-fifth larger than the tooth, to allow for shrinking. In a hole in a bottom of the mould a platina pin is inserted, the upper half of which becomes firmly imbedded in the tooth. It is by means of this pin that the tooth is afterwards attached to the base. The usual method of applying the enamel is to lay a thin coat of the enamel and flux mixture over the inside of the mould before the body composition is put in. After all this is done a lid is put upon the mould, and the whole mass within it is compacted by strong pressure, and dried by being exposed in the mould to a slow heat. After the drying the teeth will readily

fall out of the mould if inverted, but they are extremely tender, and require to be cautiously handled. They have now to be trimmed and finished, after which they are placed on small fire-clay slides or trays, sprinkled with coarse quartz sand. These trays are then slid into a muffle or firing vessel, which is closed, and carefully luted and run into a furnace. Much experience and judgment are required to estimate the proper time and degree of heat to allow for firing. If over-fired the teeth are injured; if not fired enough they must be put quickly back and heated longer. When the firing is over the teeth are perfectly hard and durable. Such mineral teeth, as they are called, appear to be universally used in America. The teeth are made in large manufactories, and all the dentist has to do is to fit the base.

The best base for mineral teeth is gold. For metal bases of all kinds a pair of metal dies is necessary, one of the dies being an exact model of the gum (usually in zinc, gun-metal, or some other metal with similar properties), the other a counter-model, for the most part in lead. Besides gold, silver and aluminium are the principal metals used for bases, but neither of these is at all fitted to take the place of gold. Silver requires as much labour to be expended upon it as gold does, and when a base is made of this material it does not answer the purpose nearly so well as one made of the more valuable metal. If constantly worn it corrodes and produces sores in the mouth. It is, therefore, seldom used for permanent sets, though frequently for temporary ones, when gold is to be used for the permanent sets. Aluminium is scarcely ever used as a base for teeth intended to be worn, as it is impossible for the best workman to make a perfect fit with it, the metal shrinks so much in the casting. It is hence used only as a base for model sets. Another kind of base now sometimes used is an alloy of tin and bismuth. Celluloid has also been tried. But all other substances have latterly been displaced to a large extent as materials for bases by what is called dental vulcanite, prepared from caoutchouc. The great recommendation of this is the ease with which it can be worked, and its cheapness. The material is manipulated in an unvulcanized state. When slightly heated it is very pliable, and can be pressed between plaster moulds, and forced into the finest crevices. When the teeth have been placed in the base thus moulded, the mould containing the gum and teeth in position is placed in a copper boiler made for the purpose, called a vulcanizer, heated to 320° Fahr. It is kept there more than an hour and a half, and when taken out the vulcanizing is complete. All that remains to do is to polish it and fit it to the mouth with accuracy, by paring and filing, all which can be easily done. A composition called continuous gum-work is also used as a base for artificial teeth, but its manufacture is very difficult. When a set is successfully made with a base of this kind it has all the appearance of the natural gum and roof of the mouth; but it is very brittle, and when broken cannot be repaired. When partial sets of teeth are made they are generally made in the same way as complete sets, gaps being left in the base for the genuine teeth remaining in the person's mouth. Even a single tooth is sometimes supplied in this way. When the root of an old tooth remains a crown may be supplied either by inserting the pin of a mineral tooth in the central canal of the root, or by fixing on the crown of a natural human tooth in the same way.

Sometimes even the crown of the natural tooth is only partly artificial, that is, the tooth being partially decayed is restored by stopping or filling. The

principal materials used for this operation are gold, tin, amalgams, and cements. Gold is used either in the form of gold-foil or in the form of what is called crystal sponge gold, so called from its having the appearance of a crystallized sponge. Gold-foil is sometimes used for stopping without any previous treatment, but some dentists first anneal it over a spirit-lamp. With this material so treated a very solid filling may be obtained, almost as solid as if the metal had been melted and poured into the cavity. Sponge gold is often used for building up the entire crown of a tooth. The gold must be thoroughly condensed by some mechanical means so as not to leave it porous enough to absorb the acids of the mouth, which would in that case find their way to the walls of the cavity and continue their work of destruction. Tin-foil is not often used for stopping. It requires as much manipulating as gold-foil, and is not so durable, nor so profitable to the dentist. In addition to this, the corroding action of the heat and acids of the mouth has the effect of depriving the tin-foil in course of time of its bright appearance and smooth surface. Tin is also a common constituent of amalgams. The commonest amalgam, indeed, is a mixture of silver and tin. Some amalgams are of cadmium and tin, others of cadmium and silver. The metals composing an amalgam are melted together, cast into an ingot, and made into filings, which are sold to the dentist, who mixes a small quantity of the filings with sufficient mercury to make a thick paste, which he puts into a cloth and squeezes so as to force out the superfluous mercury. The mass that remains is used for the stopping, and in a few minutes is sufficiently hard to receive a burnishing. When put in by a competent chemist a stopping of this nature will last for many years, but it requires much experience and dexterity to insert it properly, and it is accordingly mainly used as a temporary filling. The cements used for stopping teeth are usually chlorides, sulphates, and oxides of zinc. They are technically termed artificial bone. Excellent stoppings may be made with them, but they are open to the same objection as amalgams, being difficult to apply with success. Another material often used for stopping teeth is gutta-percha, and it often does very well. The gutta-percha is softened over a spirit-lamp (it will not do to use hot water for the purpose), and is then firmly rammed into all the interstices of the tooth by means of a blunt-pointed instrument called a plugger. Before being stopped with any substance the tooth must be thoroughly cleared of all decayed and decaying matter.

#### TEETOTALISM. See TEMPERANCE SOCIETIES.

TEFLIS, or TEFLIS, a city of Russia, capital of the government of same name, and of the general government of Caucasus. It stands on the Kur, at the extremity of a defile formed by two ranges of mountains, at the meeting-place of the principal roads between Cis- and Transcaucasia. Railways connect it with Poti on the Black Sea, Baku on the Caspian Sea, and Kars. When seen from a distance it has an imposing appearance, but the streets are narrow, filthy, and dusty. The city contains large caravansaries, an hospital, an arsenal, and a number of Armenian, Greek, and Catholic churches, several of them fine buildings; mosques, bazaars, and government buildings. The houses are built of brick, mingled with stones and mud, with doors and windows exceedingly small. Many of the dwellings are mere mud huts. Teflis has been long celebrated for its baths, which are the daily resort of both sexes as places of luxury and amusement. For recreation there is a large public garden, and there is also a botanic garden about 2 miles further down on the

**Kur.** The manufactures include carpets, silks, shawls, &c., and the trade, chiefly in the hands of Armenians, is very extensive. Teflis is an ancient town, and was once larger than it is now. It was formerly the capital of the Kingdom of Georgia, with which it came into the possession of the Russians in 1801. Pop. in 1897, 159,862.

**TEGNER, ESATIAS**, one of the most celebrated poets of Sweden, was born at Kirkerud in Wermland in 1782, studied at the University of Lund, and graduated in 1803. He became in 1812 professor of Greek literature and member of the Swedish Academy, in the same year was ordained priest, and in 1824 was appointed Bishop of Wexiö in Småland, where he died in 1846. As a poet he cut out for himself a new path in Swedish literature. His first attempts, consisting chiefly of small lyrical pieces, did not meet with much acceptance from the public, though they abounded with numerous and brilliant bursts of feeling. But when a young race, imbued with the classical models of German poetry, lent to the national poetry a new and vigorous impulse, Tegner's fame surmounted all obstacles, and he was regarded by all competent judges as the best and most perfect poet that Sweden possessed. His poetry is characterized by inexhaustible wit, rich fancy, and lively feeling. Among his works may be mentioned his celebrated *Frithiofs Saga*, a species of epic poem, repeatedly translated into English; his national song of the *Gotha Lion*; and *The Children of the Lord's Supper* (*Nattvardsbarnen*), translated by Longfellow. His works were collected by his son-in-law and biographer Böttiger, and published at Stockholm in seven vols. between 1847 and 1850 (jubilee edition, 1882-85).

**TEGUCIGALPA**, a town in Honduras, capital of a department and of the republic, on the river Choluteca, here crossed by a stone bridge. It became the capital in 1880. The most important public buildings are the churches and old convents. La Parroquia, the largest and most venerable of the churches, is considered superior to any in Central America, except those of Leon and Guatemala. It has a university, established in 1847. Mining is carried on near it. Pop. (1898), 15,000.

**TEGUERXIN** (*Teius Tegucxin*), a lizard inhabiting tropical America, and sometimes termed the Variegated Lizard, on account of the contrast between the colours of its body. The upper parts are of a deep-black hue, mottled with green and yellow. Two rows of white spots exist on the upper part of each side, the under parts being yellow, and marked with black stripes. The teeth are strong, the food consisting of snakes, frogs, insects, and like fare. A full-grown specimen may exceed 5 feet in length, and they are able to swim with great ease and rapidity. See *REPTILES*, Plate II.

**TEHERAN**, capital of Persia, in Irak Ajemi, towards the north-east of the province, 66 miles south of the Caspian Sea. Its situation is low and unhealthy. On the north and east are the lofty mountain ranges of Elburz and Demavend. Formerly the city was completely surrounded by a strong wall built of bricks, but it now extends beyond the limits of the wall. Round the wall is a broad dry ditch, with a glacis between it and the wall. The city has six gates, from which the main streets lead to the bazaar in the centre of the town. The smaller streets on the right and left have no thoroughfare. Recently the main streets have been lighted with gas and laid with tramways. The houses are built of unburned brick, and the city has a mud-like appearance. The principal edifice is the *ark*, which combines the character of a citadel with a royal palace, and has considerable strength, but has little architectural merit, and is indifferently decorated.

During the summer months Teheran is very unhealthy; and in that season the Shah and court remove to more agreeable quarters on the heights to the north, a third of the inhabitants, including the members of the European embassies, following this example. The principal manufactures are carpets, silks, cottons, and articles in iron. The ruins of Rei, the most remarkable in Persia after those of Persepolis and Pasargadae, lie an hour's walk south-east from Teheran. Pop. estimated at 200,000.

**TEHUANTEPEC**, a town in the Mexican Republic, in the state of Oaxaca, 10 miles above the mouth of a river of the same name, which falls into the Pacific Ocean. It consists of two distinct portions, one inhabited by whites and the other by Indians. The latter have made great progress in civilization, and produce considerable quantities of indigo and cochineal. The mouth of the river is encumbered by a dangerous bar, on which account it is little used for navigation. The town is near the south side of the Isthmus of Tehuantepec, the narrowest part of N. America, having the Gulf of Tehuantepec on the Pacific side, the Bay of Campeachy on the Atlantic side; width, about 115 miles. There have been various schemes for constructing a canal or a ship-railway across the isthmus, the most recent of the latter sort being that of an American engineer named Eads. The idea was received with great favour in the United States, and in 1887 a bill passed the senate authorizing the incorporation of a company to carry out the project. The total length of the line, from the Atlantic to the port of Salina Cruz on the Pacific, was estimated at 135 miles, and the cost of construction at sixty million dollars. Captain Eads, the projector, died in 1887. Pop. 8000. See *SHIP RAILWAY* in SUPP.

**TEIGNMOUTH**, a seaport and market-town in England, in the county of Devon, 12 miles south of Exeter, at the mouth of the Teign. It is divided into two parts, called respectively East Teignmouth and West Teignmouth. East Teignmouth, which is the more modern, is almost entirely appropriated as a watering-place, and has all the conveniences usual to such places of resort—carriage-drives, promenades (the principal of which is that on a piece of land called the Den, stretching out into the sea), public rooms, bathing establishments, &c. West Teignmouth is the port and principal seat of business. It has a safe and commodious harbour, though somewhat difficult to enter on account of a shifting bar. There is a quay here as well as one at East Teignmouth. Coal and culm are imported; granite and porcelain clay are exported; and the home fishery employs a considerable number of the inhabitants. The town has an infirmary, temperance hall, sailors' home, baths, breweries, a shipbuilding yard, &c. Teignmouth is a station of the Great Western Railway. Pop. in 1891, 8292; in 1901, 8636.

**TEINDS**, the Scotch law term for tenths or tithes, but limited to the tithes of the fruits of the land, since what are called personal tithes—that is, tithes of the products of personal industry not applied to land, were never levied in Scotland. The teinds in Scotland, as elsewhere the tithes, were early claimed by the church. Teinds were then for a time actually enjoyed by the parochial clergy, but at the present day there are very few cases in which the right to the teinds belongs to them, and in those cases that right has been commuted. In the great majority of instances the teinds now belong to the heritors or owners of the land formerly paying them, to the crown, or other proprietors, the possessors being charged in all cases with the payment of the minister's stipend, and being liable to be called upon up to the limit of their teinds for augmentation of stipend.

**TEKELI, or TÖKÖLY, EMMERICH, COUNT OF,** a Hungarian noble, celebrated for his efforts to deliver his country from the dominion of Austria. His father, Count Stephen, had headed an insurrectionary movement against Austria, and he himself was chosen by the Hungarians in 1678 their commander-in-chief. Determined to allow himself no rest until he had freed his country from the German yoke, he broke into Upper Hungary at the head of a continually-increasing force, captured several fortresses and towns, devastated Moravia, and, assisted in secret by France and the Porte, penetrated into Upper Austria. The emperor consented to redress several grievances at the Diet of Oedenburg (1681); but the insurgents were not satisfied, and refused to lay down their arms. Tekeli now put himself under the protection of the Sultan Mohammed IV., by whom he was declared King of Hungary. A war between the emperor and the Porte was the consequence, in which the Turks advanced (1683) as far as Vienna, but were totally defeated before that city by John Sobieski, king of Poland (Sept. 12, 1683). The grand-vizier wished to lay the whole blame of the defeat upon Tekeli; but the latter hastened to Adrianople, and vindicated his conduct so completely to the sultan that the grand-vizier was executed, and Tekeli received assurances of support. The count continued the war, but without success. He lost several battles, and again fell under the suspicion of the Turks, who laid hold of him and sent him a prisoner to Adrianople (1685). Meanwhile his wife was besieged by the Austrians in the castle of Munkács, where she held out for three years, until she was compelled by famine to surrender (January, 1688). By this time the Turks had discovered the groundlessness of the suspicions they entertained of Tekeli's fidelity, and had come to see their mistake in depriving the Hungarians of a leader who had so much influence among them. He was accordingly once more favoured with the support of the sultan, who designated him Prince of Transylvania. He penetrated into that country, and routed the imperial general (1690); but in the same year he was compelled by Louis, margrave of Baden, to retire. Thus alternately exposed to the caprices of fortune and of the Porte, he continued to be engaged in all the struggles between Austria and Turkey till 1697, when the Peace of Carlovitz was concluded, in which Turkey renounced the cause of the Hungarian malcontents. Tekeli then retired with his wife to the dominions of the sultan, who conferred upon him several estates, with the title of Prince of Widdin. He died in 1705 on his estate near Nicomedia, in Asia Minor.

**TELEGRAPH, ELECTRIC,** a device by means of which electric currents are employed to transmit signals between distant points. These signals may be made of long or short duration; and with varying intervals of time between them, they can be arranged to represent letters, figures, marks of punctuation, and other signs which make up a language intelligible to the eye or ear of the operator. They may also be made by pointers moved by electric currents, and capable of being brought to rest at fixed points on a lettered dial; or by legible characters printed on paper, as by a type-writer.

The general principle of the electric telegraph is based on the following facts, viz.:—

(a) That the movement of a magnet in proximity to a coil of wire, or *vice versa*, induces currents of electricity in the wire;

(b) That a freely-suspended magnet placed within the influence of electric currents passing through a coil of wire will be influenced by, and will change its position in accordance with, the direction of these currents; and

(c) That a piece of soft iron placed within the influence of a current of electricity traversing a coil of wire becomes a magnet for the time being, and loses its magnetism on the cessation of the current flow.

If, then, we have an available source of electric supply, a conducting medium or channel, which at one end can be connected with this supply at will, and which is joined at the other to a suitable coil or electro-magnet, the transmission of signals at once becomes possible.

*Sources of Electric Supply.*—The electric current required to actuate telegraph apparatus is usually obtained from batteries, either primary or secondary.

*Primary Cells.*—When a plate of copper and a plate of zinc are placed in a vessel of acidulated water and connected together by means of a wire, electricity is generated by chemical action. A difference of potential is set up, and a current passes from the zinc through the liquid to the copper, and thence through the wire back to the zinc. If the wire be disconnected, the circuit or path is broken and the current of electricity ceases to flow.

A simple cell, such as that described, would be of little use for practical purposes, because of its tendency to rapid polarization, a condition brought about by the deposit of a coating of zinc on the copper plate. To remedy this defect the copper plate is placed by itself in a porous cell filled with sulphate of copper crystals, the porous cell being immersed in acidulated water alongside the zinc. This arrangement constitutes the Daniell cell. The elements in the Bichromate cell are zinc and carbon, the former being kept amalgamated by contact with mercury, and the latter, which takes the place of copper, being placed in a solution of bichromate of potash and sulphuric acid. In the Leclanché cell the carbon plate is surrounded by peroxide of manganese and powdered gas carbon, sal ammoniac being the excitant employed to act upon the zinc. Dry cells having zinc and carbon elements are employed to some extent, and a number of other types are in more or less extensive use.

*Secondary Cells* consist of specially-prepared lead plates immersed in dilute sulphuric acid. They have not in themselves any power to generate current, but if a current from a dynamo or other source be passed into them unstable chemical compounds are formed on the plates, which, when the exciting current ceases, set up a reaction tending to restore the previous conditions. In other words, an electromotive force is established which is capable of generating a current opposite in direction to the charging current; and this secondary current will be maintained until the plates have regained their original condition. Such arrangements are known as Storage Cells or Accumulators.

A number of cells connected together form a battery, and the size and character of the batteries for telegraphic purposes are determined by circumstances. Daniell batteries are employed on short lines and for instruments worked in 'local circuit'; Leclanchés, for circuits worked only at intervals and for electric bells; Bichromates, for circuits requiring comparatively heavy and constant currents; and Accumulators, for universal battery working, i.e. the supply of current to a number of circuits from a common battery.

*Telegraph Lines—Conductors.*—Connection between distant points is established by means of wires of iron, steel, copper, or bronze carried overhead on poles or laid underground or along the bed of the sea. Overhead wires are usually bare, and are bound to porcelain insulators fitted on cross-arms attached to the poles so as to prevent the escape of the electric current which they are required to carry. A copper

wire gives the best results, principally because of the low resistance which it offers to the passage of a current of electricity. Iron is, however, much less costly, and as it satisfactorily meets many conditions of work it is extensively used. All underground and submarine conductors are made of copper, and it is necessary to carefully insulate them throughout their length. Gutta percha is largely employed for this purpose. Very good results have attended the use of specially-prepared paper as an insulator, the wires so treated being inclosed in a lead sheath carefully sealed against damp. Underground conductors are drawn into cast-iron pipes or into smooth conduits of earthenware or concrete, and those laid under the sea are made into strong cables sheathed with iron or steel armour to protect them against physical injury.

*Systems of Working.*—It will be gathered from what has been said respecting the simple voltaic cell that the electric current is conventionally assumed to travel in a circuit and return to the point from which it started. In telegraphic signalling it is not, however, necessary to provide a second wire for the return current. At either end the conductor is led to earth. Hypothetically the earth is a reservoir of electricity at an unvarying 'potential' or tension, and instantly affords compensation at any point connected with it from which electricity may be drawn. We say, therefore, that after performing its function a current returns or completes its circuit through the earth.

*The A B C Telegraph* (fig. 1 on plate).—An arrangement by means of which magneto-electric alternating currents are caused to actuate a pointer, which can be brought to rest at any letter on a dial by the depression of the corresponding key on the communicator. The mechanism is complicated, but the system is simplicity itself, and does not demand any special skill or knowledge of telegraphy on the part of the operator. Its use is, however, restricted to minor circuits because of the slow rate of working obtainable. Batteries are not required, the working currents being produced by a small hand-driven magneto generator, which forms part of the instrument.

*Printing Telegraphs.*—The Hughes printing telegraph, although not of recent design, is one of the most effective and reliable in existence. It is very largely used on circuits between Great Britain and the continent of Europe. It consists of a short keyboard somewhat similar to that of a piano, each key representing a letter or figure; and these keys are connected with an equal number of small vertical rods moving in holes arranged in a circle. A horizontal arm pivoted at the centre of this circle is kept in constant rotation, and on the depression of a key makes contact with the corresponding rod and sends a current through the line to the distant station. This current passes through the coils of the sending as well as of the receiving instrument, and causes the former to print the letter sent so that transmission can be verified.

The type wheel of the receiving instrument carries the letters of the alphabet and figures in relief on its periphery, and these are kept constantly inked. The current from the distant station passes through an electro-magnet and releases an armature which lifts a paper tape into contact with the type-wheel. The instruments at each end must be kept in synchronism, and when in proper adjustment the type-wheel will print the letter or figure sent out by the key at the distant station. The speed of the instruments is regulated by a vibrating spring carrying an adjusting weight, and as each letter is printed the tape is moved forward one step.

The Hughes instrument is largely mechanical, and

only one current impulse of the shortest possible duration is required to signal each letter.

The 'Baudot' is a multiplex printing telegraph. The keyboard used is similar to that of the Hughes instrument but smaller, letters being signalled by combinations of the keys. It is not in general use in this country, but is fitted to a few circuits working to the Continent. In France its use is very wide, and it works with great satisfaction. Eight messages, *i.e.* four in each direction, can be transmitted simultaneously by this system.

The type printer of the Exchange Telegraph Company is used to serve a large number of stations simultaneously from one transmitter, and it can be arranged to print in column form. The Steljes recorder takes the place of the indicator of the A B C instrument, and prints the letters in Roman characters on a tape as they are sent out by the communicator.

It may be remarked that the attention of inventors during recent years has been increasingly turned to the perfection of type-printing systems, of which many beautiful and ingenious examples cannot even be mentioned here.

*Writing Telegraphs.*—By the Telautograph, invented by Elisha Gray, an exact facsimile of the handwriting of the sending operator is reproduced at the receiving station. The instrument may be used to transmit drawings and sketches as well as messages. It is possible to employ it as an adjunct to the telephone to instantly confirm or complete in writing business transactions made verbally by that means. Its speed, however, is much too low to compete successfully with other systems in the transmission of messages.

It will be convenient at this stage to understand the Morse characters as here given (fig. 1), viz:—

A	---	J	----	S	---
B	----	K	----	T	---
C	----	L	----	U	---
D	----	M	----	V	----
E	.	N	---	W	----
F	----	O	----	X	----
G	----	P	----	Y	----
H	----	Q	----	Z	----
I	..	R	----		
1	----	.	----		
2	----	?	----		
3	----	,	----		
4	----	'	----		
5	----	( )	----		
6	----	"	----		
7	----	----	----		
8	----	/	----		
9	----				
0	----			END OF MESSAGE	----

Fig. 1.

The short signals are called dots; the long ones dashes. A dash is equivalent in duration to two dots with a space between.

*The Single Needle* (fig. 2 on plate) consists of a coil or coils, within the influence of which a small induced magnet is suspended. The passage of an electric current through the coils causes the magnet to deflect in one direction, and if the current be reversed the magnet will swing in the direction opposite to its first movement. The axle upon which the magnet is fixed is prolonged, and carries at its extremity a pointer which plays between two stop-pins or sounding pieces secured to a dial. The currents are sent out to line by means of a commutator, consisting of two





keys or tappers, so connected to a battery that the depression of that on the right hand ensures a deflection of the needles or pointers to the right at both the home and distant stations, and a depression of that on the left, by reversing the current, causes a deflection of the pointers to the left. If it be understood that a movement to right represents a dash, and one to left a dot, it at once becomes apparent that words composed of Morse letters, as shown above, can be transmitted with facility between distant points; and further, that the sending station is able to see, by the movements of its own needle, that signals are being properly sent.

The single needle is primarily a visual telegraph; but in practice it is usually fitted with sounding-pieces, which, on being struck by the needle, give out distinctive notes, and messages are read off aurally without difficulty.

Bright's bell-telegraph is an adaptation of the single needle, the working currents actuating two bell-hammers attached to the armatures of electro-magnets in addition to the pointer, and these give out loud and clear signals representing dots and dashes respectively.

**Morse System.**—In the needle system above described the signals are of equal length, dots and dashes being distinguished by the direction of deflection of the needle or the particular bell struck. But in the Sounder instrument, which has but one lever or hammer, the signals are distinguished by their duration, and, as the name implies, are read or translated by the ear.

The Morse or Sounder system is at once the simplest, most reliable, and most widely used of all. In its elementary form it consists of—

- (a) An electric battery.
- (b) A line wire.
- (c) A switch to place the battery in connection with the line at will, technically known as a 'key'.
- (d) A Morse 'sounder', to receive and give out signals.

The circuit is usually supplemented by the addition of a galvanometer, to show by the deflection of its needle that the electric currents are passing out to line.

The Morse key (see plate) is a simple brass lever held by means of a spring in metallic contact with a fixed stop at one end, and capable of being brought into contact with a second stop near the other end by pressure on the wooden knob or handle, the first contact being at the same time broken. If now the line-wire be attached to the brass lever by means of the screw terminal permanently fixed on its base, and a wire from one pole of a battery be connected to the terminal on the brass piece carrying the front stop, it only requires a depression of the key by a touch of the operator's hand to make a connection between the battery and the line wire, and if the circuit be otherwise complete an electric current will flow as long as the key is held down, and will cease to flow directly it is released and allowed to resume its normal position. The various parts are mounted on a wooden base, which insulates them from each other.

The sounder (see plate) consists of a small electro-magnet with soft-iron cores, across the armature of which is screwed a brass rod, pivoted at one end, and held away from the magnet and against a fixed stop by an adjustable spring attached to an elbow extension below the fulcrum. If an electric current be passed through the coils the armature will be attracted, the restraining force of the spring will be overcome, and the brass rod or 'tongue' will be brought down sharply against a sounding-bridge of brass, and it will remain in that position as long as

the current continues to flow. When the current ceases, the soft-iron cores of the electro-magnet lose their magnetic force, and by the action of the spring the tongue is instantly brought up into its former position against the stop with a sharp metallic sound.

Since the passage of the electric current along a wire is practically instantaneous, it will be obvious that the tongue of the sounder at one end will move in exactly the same way as, and synchronously with, the key of the operator at the other. If the key be depressed and instantly released the sounder at the distant station will respond by striking the sounding-bridge and instantly returning to its normal position. If the key be held down for a longer space of time and then released, the tongue of the sounder, after striking the sounding-bridge, will remain against it for a corresponding space and will thereafter promptly resume its original position. In the first case a dot (representing the letter *e* in the Morse code) would have been signalled, in the second a dash (representing the letter *t*). If the prolonged signal had promptly followed the shorter one with only a sufficient interval between to allow the tongue of the sounder to rise and strike the upper stop, a dot and a dash together, forming the letter *u*, would have been transmitted.

The arrangement of a simple sounder circuit of the kind described is here shown diagrammatically:—

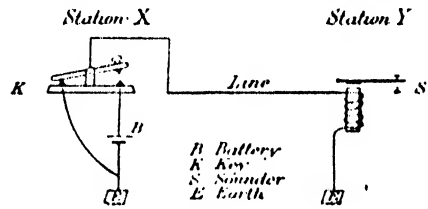


Fig. 2.

For practical purposes each station would be fitted with both sounder and key, so that signals might be sent in either direction; and a little consideration will show that a sounder placed in circuit at station *x* between the back-stop of the key and earth would, when the home key is in the normal position, receive any current sent from station *y*, and would be left isolated and unaffected by a current sent out by the key at its own station.

**The Relay.**—The simple or direct sounder circuit is used only for working to comparatively short distances. Leakage of the electric current at the points of support of overhead wires, and increased resistance to the passage of the current, render the employment of a relay necessary on long circuits.

The standard form of relay (shown on plate with cover removed, fig. 5) consists of an electro-magnet, the coils of which are differentially wound, and having the soft-iron cores slightly extended at top and bottom. Between the pole-pieces two short armatures attached to a perpendicular axle are allowed to move within the limitations permitted by the German-silver tongue on its extremity. The play of this tongue is restricted by two adjustable screws, one on either side, and the armatures are kept magnetized by the inductive effect of a large permanent magnet of horse-shoe form, part of which can be seen in the illustration.

The passage of a current through the coils causes the polarized armatures to be attracted to one side or the other according to its direction. The tongue of the relay is normally biased against one of the contact stops, so that a positive current coming in



from the 'down' side only tends to hold it more firmly in position, while if the current be received at the 'up' side, the tongue moves across and makes contact with the other stop during its passage.

The relay is so sensitive than an incoming current, though inadequate to operate the sounder, is sufficient

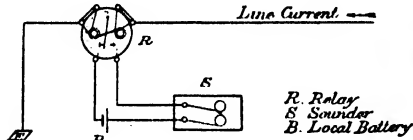


Fig. 3.

to actuate it, and directly the tongue is drawn over and makes contact with the stop in the manner described, a local circuit, having within it a sounder and a battery, is completed, and the signal is given out. The arrangement is here shown diagrammatically.

**Double-Current Working.**—In working over long lines certain electrical phenomena which do not interfere with working over short circuits present themselves.

The loss of current due to leakage, and the increased resistance owing to the greater length of the conductor, have already been mentioned. In addition, there is the phenomenon of electro-static capacity, or the power which a circuit has of acting as a condenser and absorbing and temporarily holding a charge of electricity. The effect of capacity is that the current wave does not immediately attain

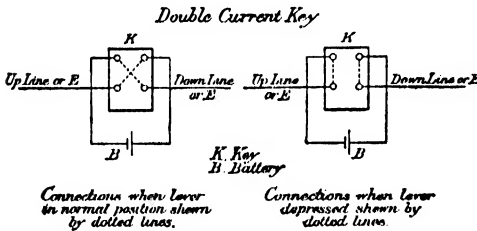


Fig. 4.

its full height at the distant end of the line; the signal is by this means retarded somewhat, and if it be quickly followed by others the result is practically a continuous bias in one direction. This difficulty is much more prominent in the case of wires carried underground than in those erected overhead, and as one remedy double-current working is employed.

In this system the simple key or switch already described is replaced by one which acts as a commutator and reverses the direction of the current at each movement of the lever. The key is brought into circuit by a switch when it is desired to send a signal, and in its normal position connects the positive pole of the battery to the up-line or earth, and the negative to the down-line or earth. The current sent out enters at the 'down' side of the relay at the distant station, holds the tongue firmly in its normal position, and completes the circuit to its starting-point. If the key be depressed the connections are instantly reversed; the current enters the 'up' side of the relay at the distant station, a signal on the sounder being the result. For actual transmission of signals the process is the same as in the single-current system; but the reversal of the current directly a signal has been sent neutralizes and cuts short the prolongation of the current and clears the line for the next signal, thus largely overcoming the evil effects of electro-static capacity.

**The Duplex System.**—With the exception of the 'Baudot' the methods of working hitherto dealt with have been what are technically termed 'simplex', or 'up and down'; that is to say, the circuit can only be operated from one end at a time. But it is possible to so arrange a sounder, Hughes, or any other circuit, that messages can be transmitted and received at both ends simultaneously, thus doubling the carrying capacity of the wire. A circuit so arranged is said to be 'duplexed', and the economic importance of the device cannot well be over-estimated. Two operators, one to send and the other to receive, are required at each end.

Two systems of duplex working are in general use, the 'differential' and the 'bridge', the first named being most widely used.

The principle of differential duplex may be readily understood by a simple experiment with some of the

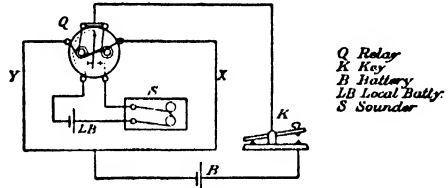


Fig. 5.

apparatus already described, supplemented by a resistance coil. If we take a relay having its coils joined in series, and by means of a key pass a current of electricity from a battery through it in such a manner as to divide equally between the coils as shown in the diagram, it will be found that the tongue will be unaffected, and that no signal will be given on the sounder in the local circuit. But if the resistance of one of the return wires be increased so as to cause a preponderance of current to traverse one of the coils, it will be found that the relay will respond, and the tongue will be drawn to one side or the other as the case may be.

Suppose now that one of the return wires x be extended to represent an actual line, and that a sounder be placed in circuit in it, and that resistance equal to that of the line circuit x be inserted in the 'compensation' circuit y, viz.:

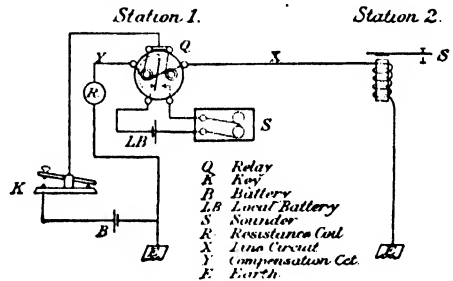


Fig. 6.

it is clear that equal currents will flow through the home relay on the depression of the key k, but that while one of these will return to the battery through the compensation circuit x the other will traverse the line circuit x to the distant station, there actuating the sounder or relay, and return to the battery through the earth.

If station 2 be fitted up in the same manner as

station 1, it will be apparent that signals can be transmitted by either station to the other, just as in simplex working; but, notwithstanding the fact that

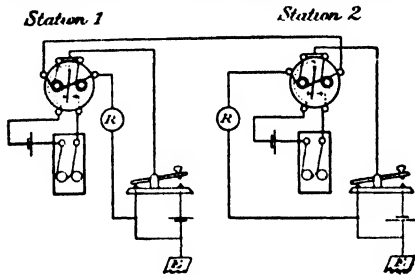


Fig. 7.

the working currents sent out pass through the relay of the sending station, they do not affect the receiving apparatus at that station.

It will readily be understood from the diagram, that if both keys be held down simultaneously there will be a preponderance of current flowing through each relay in a direction which will cause both to respond. Signals will be registered by the sounder in exact accordance with the movements of the relative keys, and the circuit will work without the slightest confusion of signals just as though there were two separate and independent wires between the stations instead of one.

It is customary to employ the double-current system on all duplex circuits except those of very short length. A single-current arrangement has, however, been shown in the diagrams for the sake of simplicity.

In adjusting a duplex circuit, the aim is to as nearly as possible reproduce in the local or compensation circuit the actual conditions which obtain in the line circuit and so secure a perfect balance. If the balance be upset, it is obvious that disturbance will at once arise. To enable an accurate balance to be secured a differentially-wound galvanometer is placed in circuit at each end, and the artificial resistance *R* in the compensation circuits is varied until the needle of the galvanometer remains steady whatever the position of the key, thus showing that equal currents are passing through the line and the compensation circuit respectively.

The electro-static capacity of a circuit is especially felt in duplex working, and to counteract its effects a condenser or container of static electricity is joined across the artificial resistance in the compensation circuit. This condenser is fitted with a plug-switch, by means of which the area of the plates in circuit can be varied at will and so made to correspond with the capacity of the line. When a current is sent out the condenser takes up a charge of static electricity in the same way as the line, and the discharges which take place immediately the potential is lowered neutralize each other. If the condenser be out of adjustment false signals or 'kicks' will be registered, and the fact will also be announced by the behaviour of the galvanometer pointer.

'Bridge duplex' is generally employed on circuits which contain submarine cables, and depends upon difference of potential instead of difference of current. Differentially-wound apparatus is not required.

Duplex circuits are usually fitted with a switch, by means of which simplex working can be reverted to at will.

**The Quadruplex System.**—This system is equivalent

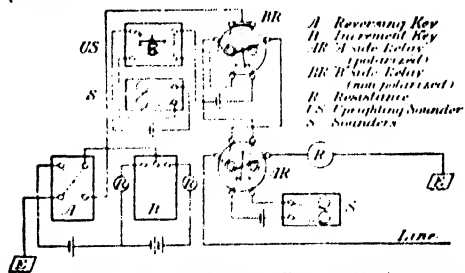
to two duplexes, and by its aid four messages, two in each direction, may occupy a single wire simultaneously. Four operators are required at each end.

It consists of a double-current duplex set called the A side, to which is superadded a second duplex, the relays of which will only respond to augmented currents. This is called the B side.

The relay on the B side is non-polarized, and will respond to a current passing through its coils in either direction; but it is biased by means of a spring against the working currents from the A side, and is adjusted to move only in obedience to the heavier currents sent out by the B or increment key at the distant station. The currents from the A key pass out through the home relays differentially, just as in the duplex system already described, and are received on both relays in series at the distant station. They are only of sufficient strength to affect the A relay, but the depression of the B key brings an auxiliary battery into action, and by this means the B relay is actuated and a signal given. This is known as the increment method.

The B side of the quadruplex is worked by single current, and the special form of sounder in circuit with the non-polarized relay acts as an intermediate relay. It is known as the uprighting sounder, and controls an ordinary sounder and battery in local circuit upon which the working signals are received. This arrangement is necessary because of the tendency of the B relay to 'kick' or break the signals during the reversal of current caused by the working of the A key. The tongue of the B relay is normally held against the battery contact by a spring, so that the local circuit through the uprighting sounder is complete, and its tongue is held down. On the passage of a working current from line, the tongue of the relay is drawn away, the local circuit is interrupted, the tongue of the uprighting sounder is allowed to rise, and so through a second local circuit the reversed signals are 'uprighted' on to the reading sounder. The reversals of current sent out by the A key are so rapidly accomplished, that though the tongue of the B relay may leave the blank or 'spacing' contact, sufficient time is not allowed for it to reach the battery or 'marking' contact before it is again drawn away by the remagnetization of the cores. If the local circuit arrangement were made similar to that of an ordinary relay, it is clear that signals would be broken at each reversal.

The B side of the quadruplex is brought into use as may be required by means of a simple plug-switch.



In its normal position the B key connects the centre and left hand terminals and when depressed the centre and right hand terminals

Fig. 8.

In the decrement method now sometimes adopted the stronger battery power is connected to the A or reversing key instead of to the B or decrement

key. The B side relays are held open by these currents against the opposing force of a spring, but depression of the B keys so reduces them as to allow the springs to close the local circuits, thus actuating the sounders. Wheatstone automatic working on the A side is found to be more satisfactory under the decrement system; and it is not necessary to employ a relaying sounder on the B side as in the increment method.

If the principles of duplex telegraphy already described have been mastered, there will be no difficulty in understanding the quadruplex arrangement from the above diagram.

It is possible to 'fork' a quadruplex circuit, and by means of an extension wire to work the A side to one station and the B to another, only one wire between the terminal station and the point of forking being required.

Duplex telegraphy is arranged on the same principle as quadruplex, and is employed in cases where traffic is all, or nearly all, in one direction. It is simply a three-channel system, one key instead of two being fitted at the receiving end, and one sounder instead of two at the sending end.

**Multiplex Telegraphy.**—In the multiplex system the line between two stations is successively connected to a number of sets of instruments at each end, and these successive connections are effected with such rapidity that there is practically a clear and independent line permanently available for the transmission of signals between each set at one station and the corresponding set at the other. The principle of multiplex working may be illustrated as follows. A metal disc divided into segments, each insulated from the other, has at its centre an upright spindle carrying a horizontal arm, terminating in a metallic brush or trailer, which, as the spindle revolves, sweeps over the segments in turn. The line wire is connected to the trailer, and a set of apparatus consisting of a key, relay, and sounder is joined to each segment. The arrangement at the distant station is similar.

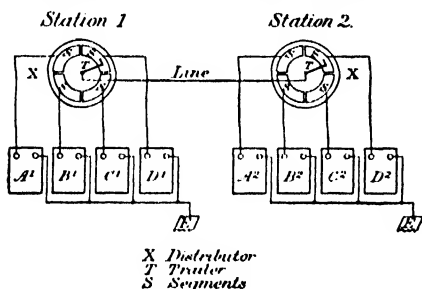


Fig. 9.

An examination of the diagram will make it clear that when the trailer T at station 1 makes contact with the segment permanently joined to the set of instruments D<sup>1</sup>, the operator at D<sup>1</sup> is placed in communication with the operator at the corresponding set at station 2. When the respective trailers move forward to the next segment, set C<sup>1</sup> is placed in communication through the line with set C<sup>2</sup>. B<sup>1</sup> and A<sup>1</sup> are in turn joined in the same manner to B<sup>2</sup> and A<sup>2</sup>, and in due course the onward motion of the trailers again joins D<sup>1</sup> through to D<sup>2</sup>. If now the trailers can be made to move in synchronism, and with sufficient speed to render the period of disconnection of the relative sets of instruments inappreciable, multiplex working becomes possible.

The system may be arranged to work any number

of ways or channels within the speed limit of the line, but the practical maximum has been fixed at six.

In actual practice the 'distributor' is divided into 162 segments, consisting of six groups of 24 each used for working, and a similar number of groups of 3 each for correcting currents. In a circuit joined up for hexode or six-way working, therefore, each set of apparatus is placed in connection with the corresponding set at the distant station twenty-seven times during each revolution of the trailer. The speed of the trailer is about three revolutions per second, and by the use of condensers joined across the receiving relays the rapid intermittent impulses picked up by each arm are converted into practically continuous signals.

The distributor is driven by current impulses from an electric battery communicated by a vibrating steel reed to an electro-magnet acting upon a phonic wheel. The reeds at either end of the line are tuned to vibrate as nearly as possible at the same speed, and exact synchronism is secured by means of correcting currents, a number of which are sent by each station to the other during every revolution of the trailer. Connections are so arranged, that if the motion is synchronous the correcting current on arrival passes to earth; if one trailer lags behind the other the correcting current is received on a different segment, from which it passes through a relay, the effect being to momentarily disconnect the local driving circuit, and so increase the rate of vibration of the reed and the consequent motion of the trailer.

This description applies to the Delany multiplex. The Pollock system introduces some variations and provides for duplex working. The Baudot already referred to is a multiplex system.

**Automatic Telegraphy.**—The rate of transmission by the systems already described is limited by the manual expertness of the operator, and the speed does not in practice exceed thirty words per minute. It is obvious that if nothing better than this could be attempted, a very large number of channels would be required to dispose of the vast quantity of parliamentary and general news daily intrusted to the telegraph authorities for despatch. To meet the want the Wheatstone automatic system has been devised, and after years of patient labour on the part of the experts of the telegraph department of the General Post Office, it has been brought to a state of perfection. By means of the automatic system, messages can be transmitted over a single wire at a speed exceeding 400 words a minute. The working speed between London and Dublin is 400 words, and between London and Aberdeen 350 words a minute. Automatic apparatus is fitted to a large number of circuits set apart for the transmission of ordinary business telegrams as well as to news circuits, and is brought into use on occasions of pressure. It may be used in both directions on duplex, and on one side of quadruplex circuits, as well as for direct working.

Messages are prepared for despatch by means of a mechanical device known as the 'perforator'. It consists of three keys connected by means of levers to three sets of small punches which, on the depression of the keys, move forward and perforate a strip of white oiled paper held in front of them. A depression of the right-hand key causes four perforations to be made in an oblique line, the two middle ones being side by side, and these stand for a dash; the left-hand key makes three perforations, but in a vertical line, representing a dot; and the middle key is used for spacing and for preparing a succession of holes to engage a star wheel in the

transmitter: at each depression the white slip is automatically moved a step forward, so as to be in position to receive the next impression. The punches are hollow-nosed, and they do not merely make an incision in the oiled paper, but actually cut out small round pieces, which fall down into a receptacle provided to receive them. The adjustment of the perforator must be very accurate: it is correct if the signals representing the word 'telegraph' punched thrice in succession and properly spaced measure exactly 12 inches.

Two small sticks of iron tipped with rubber are used by the operators to strike the perforator keys. In the Central Telegraph Office, London, where, as a rule, duplicate slips of all news messages have to be prepared because of the large number of circuits to be served, pneumatic pressure is employed to do the actual labour of punching, the keys, which are easily depressed by the operator's fingers, merely opening and closing the valves.

*The Transmitter* (fig. 6 on plate) is an automatic double-current key. It consists of a lever, 1, constructed in two portions, each insulated from the other. To one portion the line is joined, the other being connected to earth. The lever is pivoted at its centre, and oscillates within finely-adjusted limits formed by two pairs of contact stops connected to the battery. It acts precisely as a key; in one position connecting the positive pole of the battery to line and the negative pole to earth, and reversing this arrangement in the other.

The movements of this reversing-arm are directed by two rods,  $r^1$  and  $r^2$ , passing through it and controlled by levers, at the ends of which there are two upright steel rods,  $r^3$  and  $r^4$ , of a size to fit into the upper and lower perforations in the oiled-paper slip. The levers are alternately acted upon by clockwork mechanism through the rocking beam,  $c$ , and their pressure on the reversing-arm is maintained by springs,  $s$ .

The arrangement is shown by the accompanying diagram.

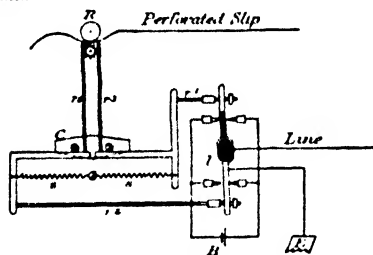


Fig. 10.

The perforated slip is passed under a small roller,  $u$ , and is carried onward by a star-wheel revolved by clockwork which engages the centre row of perforations. The rods  $r^3$  and  $r^4$  are so placed that their respective extremities will engage with the upper and lower holes in the slip, one being a little in advance of the other, and so long as an unpunctured slip passes over them they are held down, and both the rods  $r^1$  and  $r^2$  are thus drawn back from the reversing-lever 1. But directly a perforation passes, the first rod, 3, rises through the slip, and the opposing pressure being removed the spring  $s$  forces rod  $r^1$  against the lever 1, throwing its upper end against the stop connected to the positive pole and its lower against that connected to the negative pole of the battery, thus sending a current to line which will continue to flow until rod  $r^2$  rises through the lower hole of the punched slip, and permits rod

$r^2$  to force the lever 1 back to the original position, thus reversing the current and so ending the signal. Directly rod  $r^2$  has risen through the first perforation, it is withdrawn by the action of the rocking beam  $c$ , but this withdrawal merely allows the slip to pass on and does not terminate the signal, the length of which depends upon the action of rod  $r^4$ . It will be clear from this that the passage of vertical perforations will allow rod  $r^4$  to rise directly  $r^2$  has been withdrawn, so that an instant reversal of the lever 1 would result and a current of sufficient duration to register a dash at the distant station is sent out. But the oblique perforation delays the rise of rod  $r^4$  and the consequent reversal of the current for an appreciable interval, and a signal of longer duration registering a dash at the distant station is sent out.

Up till a comparatively recent date a jockey wheel carried on a steel spring was employed to act upon the upper end of the reversing lever to ensure firm contact between it and the stops connected with the battery, but this end is now secured in a more satisfactory manner by means of the attraction exercised by a permanent magnet.

The transmitter is fitted with a simple switch, which in one position brings it into operation, and in the other throws it out of action and joins up the circuit for ordinary key working. There is also a lever for regulating the speed, which may range from that of fast-key manipulation to the maximum already mentioned, according to circuit conditions. The clockwork mechanism which actuates the star-wheel and the rocking-beam is driven by a weight or an electric motor.

*The Receiver* is the instrument which at the distant station receives the currents sent out by the transmitter and records the signals by ink-marks on a blue slip. Its construction is exceedingly simple. It is, in fact, a relay such as has already been described, but in addition its armature-spindle is fitted with an arm holding a very small disc on an axle which is revolved by clockwork. This disc is kept inked by contact with a larger one which dips into an ink-well, and on the passage of currents through the coils it is carried against a moving blue-paper ribbon, upon which it marks Morse signals, i.e. dots and dashes, according to the duration of the currents. The coils are arranged for simplex or duplex working, and the receiver acts the part of a relay as well as a recorder, having a sounder in local circuit. It is fitted with a speed-regulator, and with a switch for starting and stopping the paper slip, which is made up in rolls and accommodated in drawers in the wooden base of the instrument. A receiver is shown in the centre of the accompanying illustration of a repeater (see plate, fig. 7).

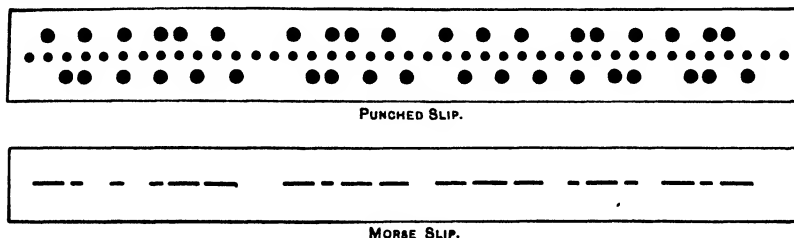
When it becomes necessary to resort to automatic working the messages to be sent are distributed amongst a staff of operators, who prepare the perforated slip in the manner described. The distant station is then warned that Wheatstone working is about to begin, and he starts his receiver at the same time that the transmitter at the sending station is brought into operation. The various punched slips are passed through the transmitter in proper order, and the messages, on being received in Morse characters on blue slip at the distant station, are distributed amongst a staff of clerks, who quickly transcribe them on forms for delivery to the addressees.

Specimens of punched (forwarded) and Morse (received) slips are shown on next page. The word in both cases is 'New York', and the effect of the vertical and oblique perforations in producing dots and dashes respectively is clearly seen.

*Repeaters.*—It will have been gathered that the

speed of a telegraphic line depends upon certain physical conditions. First, there is the resistance which the conductor offers to the passage of the electric current; then there is the loss of portion of the current at points of support, which in wet weather is very considerable; the capacity of the circuit,

particularly if portions of it be laid underground, makes itself felt; as well as the self-induction of the apparatus coils and the inertia of the moving parts. These combine to render direct working over a long line a matter of difficulty even at slow speed, and make fast automatic working impossible.



In such circumstances it is frequently found necessary to place a repeater or repeaters in circuit at intermediate points for the purpose of relaying or renewing the working currents *en route*.

The essential principle of the repeater is precisely that of the relay already described. In order to admit of working on the double-current system in both directions, of duplexing, of speaking to either or both terminal stations, as well as of verifying passing signals, many accessory pieces of apparatus have to be added; but a workable single-current repeater fully illustrating the idea may readily be made up of two standard relays, as here shown:—

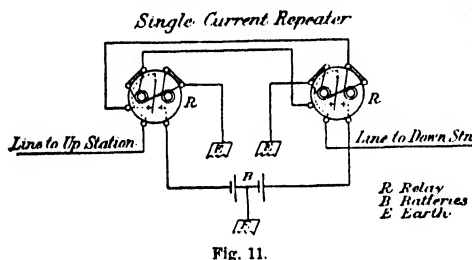


Fig. 11.

A fast-speed repeater of modern form is shown in the illustration (fig. 7 on plate). The standard relays which form the nucleus of the arrangement are shown two at either side, behind them being the condensers topped by adjustable resistances known as rheostats. Close to the relays are the speaking keys, one for the up, the other for the down line, and behind them are placed the auto switches which, in obedience to the movements of the relays as they are actuated by incoming currents, connect the local batteries to the respective lines, and thus replace the spent currents received by new ones of full strength which are passed on to the distant station. Two galvanometers to mark the current-flow are fitted in full view of the attendant, and in the centre is placed the Wheatstone receiver, which can be inserted in a leak circuit at will and made to register signals on Morse slip as they pass through. The repeater is entirely automatic in its action, only requiring to be kept clean and in accurate adjustment.

The best results are obtained by placing a repeater in such a position in a circuit that the lengths on either side shall be as nearly as possible equal in resistance and capacity. If these are unequal the speed will not be more than that of the highest section. Where a long submarine cable forms part of a circuit the repeaters are usually placed at one or both ends. A repeater may be arranged to work on a forked circuit, receiving on one line and send-

ing out the new signals on two lines in different directions.

*Submarine Cable Working.*—While Morse and Hughes working is practicable, and in general use on cables such as those connecting Great Britain with Ireland and with the continent of Europe, it would be commercially impracticable on very long cables such as those to America. The electro-static capacity of an Atlantic cable is so great, that if a system requiring a considerable working current like the Morse were employed only four or five letters per minute could be signalled. A reasonable rate of transmission is secured on ocean-cable circuits by the use of the mirror and syphon recorder instruments. Very small currents are required; indeed it is not necessary to allow the cable to discharge between successive signals, the receiving apparatus being so sensitive as to be acted upon by the pulsations due to the rises and falls of potential.

The mirror instrument is constructed on the same principle as the single needle, but instead of a pointer a small mirror fixed to a magnet suspended in the coils is used to reflect a spot of light on to a scale, and the movements of this spot to right or left, according to the direction of the current in the coils, represent the dashes and dots of the Morse alphabet.

In the syphon recorder a fine glass syphon is used to squirt ink on to a moving paper slip, the variations from left to right and *vice versa* resulting in a wavy line, intelligible to the operator in the same way as signals received by the mirror instrument.

*Railway Telegraphs.*—The electric telegraph is very largely used by railway companies, not only for the transmission of messages but for block-signalling purposes. The departure of trains is electrically communicated to the next block station by a pre-arranged number of beats on a gong, and the reply tells whether the line is clear or whether it is blocked by the presence of another train. On single lines of railway electric train staff and tablet instruments are used, the staff or tablet, which constitutes the engine-driver's authority to proceed, only being obtainable on receipt of an electric current from the next block station, which releases a locking arrangement and permits its withdrawal. Another staff or tablet cannot be withdrawn until the original has been delivered to the signaller at the next station and placed in his instrument, so that a second train cannot be despatched until the first has passed out of the section.

The movement of distant-signal semaphores and the condition of signal lights is automatically telegraphed to the signaller and visually recorded in his cabin by electric signal and light repeaters, so that notwithstanding darkness or fog or distance, or

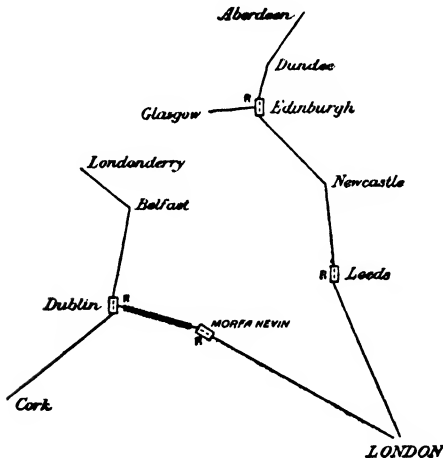
all of these, he knows exactly whether the movements of his levers have produced the desired effect upon points and signals outside his range of vision.

**Circuit Arrangements.**—The number of instruments placed in circuit is determined by the business transacted. One wire frequently serves five or six offices, at which A B C's, Single-needles, or Sounders are fitted. Where the business is considerable, a wire is exclusively set apart for the office concerned, and if necessary arrangements for duplex and for Wheatstone working at will are made.

It is obviously impossible to afford direct communication between every telegraph station and every other, and the larger offices are therefore made transmitting centres for the smaller.

Fig. 8 on plate illustrates a device for concentrating a number of minor circuits at a transmitting station. The minor circuits are led through the indicators and switch-holes to earth, and when a call is indicated the switch clerk immediately inserts one of the pegs and so places an instrument in circuit. On completion of the message, the peg is withdrawn and the original conditions restored. By this means the necessity for specially setting apart a separate instrument at the transmitting station for each minor circuit is avoided, and a smaller number of operators is required.

At the larger offices all wires are led direct to test-boxes so that alterations in circuit arrangements can be readily and promptly effected. Thus each evening, when the business of the day is over, a considerable number of wires are appropriated for auxiliary news services, being joined up and extended to the principal offices as may be found necessary. All offices in circuit receive the news simultaneously from the transmitting station by the fast-speed automatic system. A diagram, showing the arrangement of the news circuits by which Ireland and Scotland are normally served from London, is here given.



*It will be seen that Forked Repeaters are placed at Dublin and Edinburgh.*

Fig. 12.

Special circuit arrangements are made for important race meetings and other events at which a large volume of telegraphic business is anticipated.

**Interruptions of Communication.**—Telegraphic communication is subject to interruption from many accidental causes. The nature of a fault can generally be determined by observation at the testing station, which promptly takes steps to localize it.

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Wires of any considerable length are led in at a number of testing points *en route*, and by the co-operation of these a circuit may be proved section by section. When the faulty section has been found, it is often possible to replace it by a simple change or cross at the test-boxes at either end, and the through circuit is thereby restored and once more set to work. Spare wires are provided to thus replace faulty sections of important working circuits. Should the insulation of a circuit fall so as to interfere with fast speed or duplex working, it is often possible to cross it with another following a different route and utilize the weak wire for key simplex working.

Faults in long lengths of underground wire and in submarine cables are localized by means of Wheatstone-bridge tests. If these are carefully made and correct data are available, a ship is enabled to grapple for a submarine cable within a few yards of the point at which the interruption exists.

All important circuits are rapidly tested for insulation each morning before the business of the day begins. For this purpose a highly sensitive tangent galvanometer is employed. The wires are looped in pairs, and a current is sent round each loop, passing out through one coil of the galvanometer and being received through the other. The difference between the current received and that sent out represents the loss, and when this loss exceeds a fixed standard a fault exists and tests for locality are proceeded with. If the standard is maintained the wire is given up for traffic.

Telegraph lines, whether open, underground, or subaqueous, require to be protected from lightning discharges and the effects of heavy currents occasionally communicated by contact with electric light and power plant. Electricity at high potential tends to discharge across a small air gap rather than follow the course of a long conductor, and so the lightning protector generally employed consists of two discs of carbon separated from each other by means of a thin sheet of mica perforated so as to leave air spaces, one plate being connected to the line and the other to earth (fig. 9 on plate). Where danger from lighting or electric-traction plant is feared, fuses and heat coils are placed in circuit as well. These safeguards are not affected by working currents, and only come into operation when the point of safety has been passed. In another form of lightning protector the discharge takes place across a gap between the extremity of two pieces of platinum wire fused into a small glass tube. Notwithstanding the precautions taken, instruments are sometimes demagnetized by lightning, and coils and even line wires are fused.

**Wireless Telegraphy.**—A system of signalling by induction without the aid of connecting wires has frequently been employed by the British Postal Telegraph Department, and it is now in operation at several places. Some years ago it was successfully employed to maintain communication between the mainland and the island of Mull during an interruption of the submarine cable. Parallel wires were stretched along either coast, and rapid intermittent currents passed along one induced similar currents in the other. A telephone receiver was employed on one side to pick up the signals which were framed by a Morse key on the other, and messages were safely and expeditiously transmitted.

The Marconi system of wireless telegraphy consists in the transmission through the ether of Hertzian waves set up by a powerful induction-coil, which act upon a coherer or special relay at the distant point, and so register signals. To prevent the diversion and dissipation of the electric waves

through contact with obstruction *en route*, it is necessary that high masts, kites, or balloons be used at either end. This system is most successful for marine signalling. See TELEGRAPHY, WIRELESS, below.

**Historical.**—The experimental stage of the invention of the electric telegraph covers a period of over sixty years, from the researches of Leage with his twenty-four wires and pith-balls in 1774, to the introduction of a practical needle telegraph by Cooke and Wheatstone in England, another by Steinheil in Munich, and a recording telegraph by Morse in America, all in 1837. To Steinheil is due the credit of the discovery that the earth might be used as a return for the current, and that a double wire was not necessary. About 1810 Semmering had been able to signal by the decomposition of water; in 1831 Henry utilized the sounds given out by the attraction of the armature of an electro-magnet to convey intelligible signals; and in 1834 an epoch-making experiment was successfully carried out by Gauss and Weber at Gottingen, in which they transmitted signals to a distance of over a mile by means of the action of an electric current on a movable magnet.

The earliest telegraph of Cooke and Wheatstone required five conducting wires, each of which acted upon a separate magnetic needle. It was installed upon the Great Western and London and Birmingham Railways, the wires being laid underground. They were insulated with silk or cotton and laid in a composition of pitch in iron pipes or troughing. The length between London and Slough was laid by the exertions of Brunel in spite of the opposition of the directors of the Great Western Company, and it was brought prominently to public notice in 1845 through the arrest by its assistance of a murderer travelling on the railway. The five-needle telegraph afterwards gave place to the double-needle, and this has in turn almost universally been replaced by the single-needle.

In 1846 Bain invented his chemical recorder, which registered signals by electrolytic action on specially-prepared paper. In 1854 acoustic signalling was adopted in England by the introduction of Bright's bell instrument. Gintl in 1853, and Sterns in 1870, devised the system of duplex working, and Edison produced the quadruplex in 1874. The idea of multiplex telegraphy originated with Meyer in 1873, but it was left for Delany to produce a workable system, which he did in 1884 on the principle of synchronism devised by Paul la Cour.

Submarine communication was established between England and France in 1850 by means of a copper wire insulated with gutta percha laid across the Channel. Messages were successfully passed over it, but it broke the day after being laid owing to the lack of protective armour. In the following year the first real practical submarine cable was laid between Dover and Calais. It consisted of four copper conductors insulated with gutta percha and sheathed with stout galvanized iron wires, and proved a permanent and unqualified success. Shortly afterwards cables were laid to Ireland and to the Netherlands.

The stupendous undertaking of connecting Great Britain and America by submarine cable was attempted in 1858, the Atlantic Telegraph Company having been formed by Cyrus Field, Brett, Whitehouse, and Bright for that purpose. After encountering well-nigh insurmountable difficulties the project became an accomplished fact, the cable having been submerged by British and American war-vessels. But it only lasted for a few weeks, and during that time signalling could only be carried on in a spasmodic and uncertain fashion.

The result discouraged further efforts for a number of years, but in 1865 the Company again essayed

to span the Atlantic. A new cable was manufactured by the Telegraph Construction and Maintenance Company and shipped on board the *Great Eastern*. The work of laying was entrusted to Mr. Canning, Professor Thompson (Lord Kelvin) being in charge of the electrical operations. Notwithstanding the most elaborate precautions, failure again resulted, for after nearly 1200 miles had been laid the cable broke and had to be abandoned.

In 1866, the Anglo-American Company co-operating with the Atlantic Company, a third Atlantic cable was made and successfully laid by the *Great Eastern* in a fortnight. The end of the abandoned cable of 1865 was also picked up, and its laying was completed, two cables being thus made available. Since then cable after cable has been put down, and at the present time the Atlantic is crossed by no fewer than seventeen separate cables, fourteen to North and three to South America. Messages are frequently delivered in New York within a very few minutes of being handed in in London.

The telegraphs in Great Britain and Ireland were transferred from the telegraph companies to the state in 1870, and since then each year has marked a distinct step towards perfect efficiency. The speed of automatic signalling has risen at a phenomenal rate, and improvements in the manufacture of subterranean cables has greatly lessened the difficulties of working through underground wires. A cable containing seventy-six copper conducting wires insulated with specially-prepared paper has lately been laid between London and Birmingham, and further extensions are in progress. Although automatic working through this cable is not possible at such speed as could be obtained over open wires, because of the relatively high electrostatic and inductive capacity, it forms a most valuable means of maintaining communication in the event of the open lines being interrupted by wind or snowstorms.

In 1870 the number of miles of telegraph wire in operation in the United Kingdom was 60,000; it is now 350,000; and the number of messages transmitted now amounts to over 90,000,000, as compared with about 10,000,000 at the transfer. The land telegraphs of the world aggregate 780,000 miles of line and nearly 3,000,000 miles of wire.

The telephone is a telegraph both legally and scientifically, but its development has been so phenomenal, and its use is now so wide-spread, that it will be treated of in a separate article.

**TELEGRAPH CABLE.** See SUBMARINE CABLE.

**TELEGRAPHY, WIRELESS, or ELECTRIC METHODS OF SPACE TELEGRAPHY.** Of the various electrical methods which have been experimented upon with a view to transmitting signals from place to place without the use of intervening wires, that is, wires stretching from one station to the other, three are worthy of special mention, namely:—

(i) The system which makes use of the electrical conductivity of the earth or of water;

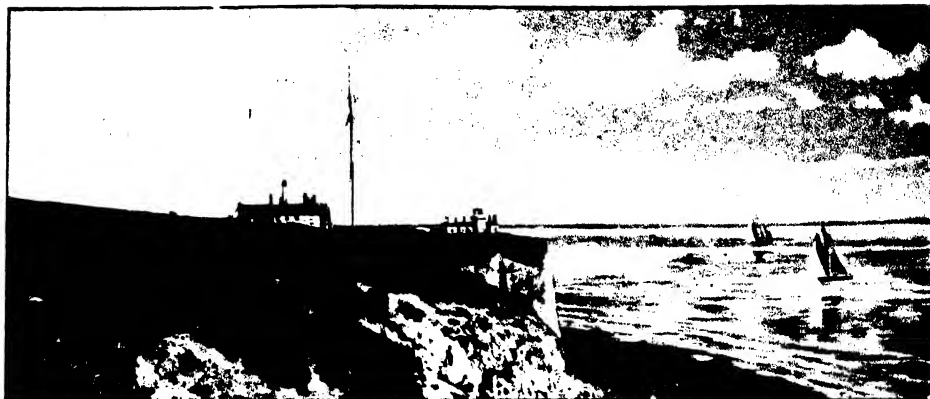
(ii) The system which depends on electromagnetic induction;

(iii) The system based upon the fact that an oscillatory spark emits waves which may be detected by a suitable instrument at a distance.

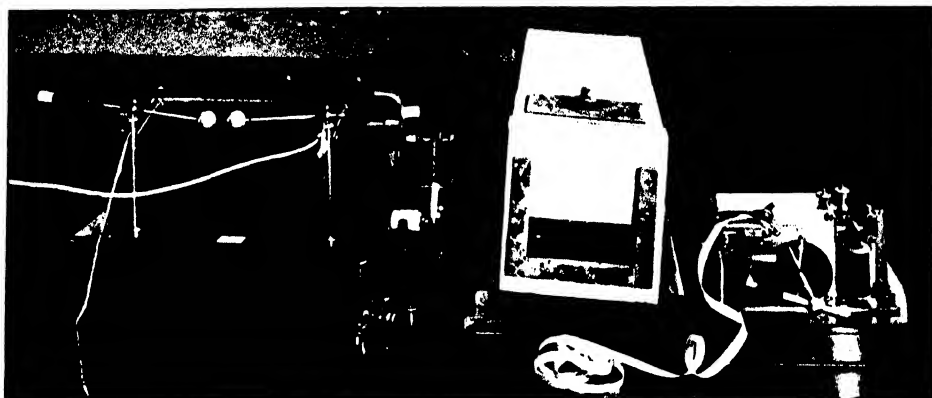
Here it may be remarked that all that is necessary for successful telegraphy is that it shall be possible for an observer at one station to know when an electric disturbance is going on at the other station, and when that disturbance ceases; for if this is possible it will be easy to arrange a code of signals based upon disturbances of short and long duration by which messages may be communicated.

(i) In 1838 it was discovered by Steinheil that the earth was a conductor of electricity. It is a

## WIRELESS TELEGRAPHY (MARCONI'S SYSTEM).



Experimental Station at South Foreland, showing the high pole, which is an essential feature of the Marconi system.



Transmitter

Receiver



Apparatus in operation - message being received and read.





very good conductor of electricity, especially if moist, not because of its low resistance, but because of the infinite number of paths by which a current may travel from one point to another. If two metal plates are sunk in the earth or sea, and connected to the poles of a current generator, the flow of current follows innumerable stream lines, so that the mass of earth traversed by the current might be supposed to be replaced by a 'resultant conductor' which would be greater in length than the distance between the earthed plates but of very great sectional area. This being so, it is obvious that if the earth be supposed to be homogeneous, the current in passing from one point to another must spread throughout the whole mass. On this system is based the conduction method of wireless telegraphy. At the transmitting station let a current (continuous or alternating) be sent from a generator through the earth between two metal plates buried in the earth or immersed in water. Along any one of the infinite number of stream lines part of the current passes; and if in this line two points be taken they will be at different potentials. If, therefore, plates be sunk at these points and joined through a receiving instrument—a delicate galvanometer if the current is continuous, and a telephone if it is oscillating—the instrument will give indications of the starting and stopping or reversing of the current in the transmitting circuit, and thus it will be possible to transmit messages. This system has been used by Morse and Gale in 1842, Wilkins in 1849, Lindsay in 1859, Johnston in 1879, Towbridge in 1880, also by Willoughby Smith, Tesla, and others. Lindsay transmitted signals across the Tay, a distance of  $\frac{1}{2}$  mile. He had at each station two immersed plates, the two at the sending station being connected through a commutator with a battery, and those at the receiving station being joined by a wire in the circuit of which was an induction coil 'to intensify the effects', and a recording apparatus, probably a galvanometer. Willoughby Smith experimented in 1882 with a view of establishing telegraphic communication with the Needles lighthouse. He laid a cable from Alum Bay, but anchored the free end of it in deep water 60 yards from the lighthouse, as cables are apt to be damaged on the rocks at the base of the lighthouse. The current from a Leclanche cell passed from this point through the water, then through the instrument to an earthed plate, and in this way Morse signals were read by a mirror galvanometer. Another experiment of Willoughby Smith (1888) had in view communication with lightships. From the sending station two wires were run out and anchored near the ship. In the circuit thus formed through the water an intermittent current under the control of a Morse key was sent. From the bow and stern of the ship two plates were suspended, dipping into the water, and having in their circuit a telephone by which the Morse signals were received. By this means successful telegraphy was carried out.

(ii) In 1831 Faraday discovered the principle of electromagnetic induction; and in 1884, when the telephone was beginning to come into extensive use, the importance of this induction was brought to the notice of practical men by the observation of disturbances in telephone wires due to telegraph circuits in their vicinity. In 1884 disturbances were noticed between circuits 80 feet apart, and in 1885 inductive effects were detected between parallel telegraph wires  $10\frac{1}{2}$  miles apart. This led Preece to conduct a series of experiments to test the possibility of wireless telegraphy on the induction system, and also to find out whether in the case of circuits which were partly wire and partly earth, the effects trans-

mitted were mainly due to induction through the ether, or conduction through the earth. For the latter results the reader is referred to the B. A. reports, 1887, &c. &c. In 1892 telegraphic communication was maintained across Loch Ness, a distance of  $1\frac{1}{2}$  mile. In the same year messages were sent across the Bristol Channel between Lavernock Point and Flatholm (3.3 miles). At Lavernock Point two thick copper wires were suspended on poles for a distance of 1267 yards, and the ends were earthed. A two-horse-power alternator of 192 alternations per second sent a current of 15 amperes through the wire. This was made and broken by a Morse key. At Flatholm the receiver was an insulated wire laid for a length of 600 yards, earthed at the ends and containing a telephone. This installation is now the property of the War Office, and is in daily use. In the Kilbrannan Sound experiments, signals were transmitted distances of 4 miles between parallel wires. In 1895 communication was maintained across the Sound of Mull by induction between parallel wires. 'A gutta-percha-covered wire was laid along the ground from Morven on the Argyllshire coast, while on Mull the ordinary overhead iron wire connecting Craignure with Aros was used. The mean distance apart of the wires was 2 miles.' Preece's transmitting arrangement simply consists of a motor-driven current-breaker which makes and breaks the circuit about 400 times per second, and a Morse key which breaks up the intermittent current into dots and dashes. His receiver is a telephone. Lodge has contributed a series of papers to the Institution of Electrical Engineers on 'Improvements in Magnetic Space Telegraphy', in which he describes an induction method of telegraphing between Liverpool College and his house, 2 miles distant. He also explains a method of 'syntonizing', and discusses the induction *versus* the conduction question, expressing the opinion that earth conduction plays a large part in all systems in which earthed plates are used, even in the Hertzian-wave system to be now described.

(iii) About 1864 Maxwell's electromagnetic theory of light was published, a theory based on the hypothesis of the propagation of electrical effects by a wave motion in the ether. In 1888 the existence of these waves was experimentally proved by Hertz. In the course of his researches Hertz found that an oscillatory electric spark was the source of waves which, spreading out in all directions, could be detected at a distance. This discovery is the basis of many attempts by numerous experimenters to effect telegraphy without wires to more or less considerable distances. We need not describe the various forms of spark generators or transmitters used by Hertz, Lodge, Righi, and others, nor the various forms of detectors used by different experimenters. The form of detector used by Marconi is due to a discovery of Branly in 1891. He found that a tube containing a column of tightly-packed metallic filings, which under ordinary circumstances is practically a non-conductor, has its electric resistance greatly reduced by exposure to Hertzian waves. He also found that

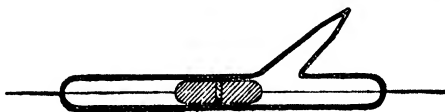


Fig. 1.

the original high resistance of the column was restored by shocks, taps, or vibrations. Nearly all the metals are suitable for coherers, except gold and

platinum, which are not sufficiently oxidizable. The coherer used by Marconi is shown in fig. 1. It con-

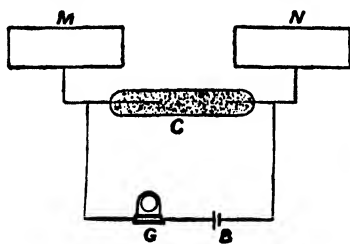


Fig. 2.

sists of a glass tube 4 centimetres long, into which two metal pole pieces are tightly fitted. They are separated from each other by a small gap, which is partly filled with a mixture of nickel and silver filings. Suppose this circuit to be put into circuit, as shown in

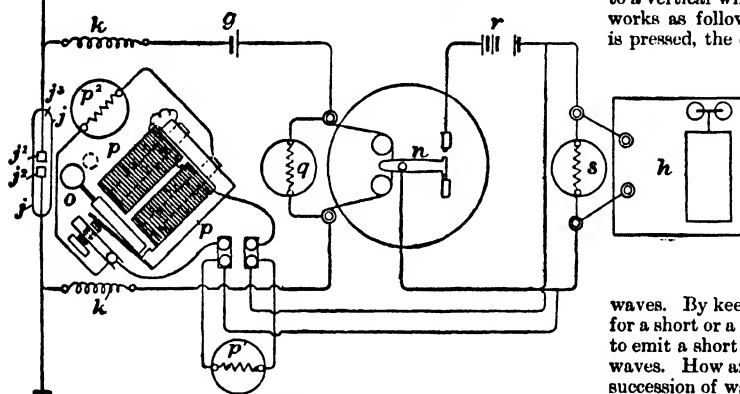


Fig. 3.

fig. 2, where *c* represents the coherer, *M* and *N* wings attached to it for the purpose of catching the electric waves, *B* a voltaic cell, and *G* a current instrument or sensitive galvanometer. In its normal condition the resistance of the filings in the coherer is very great, but when

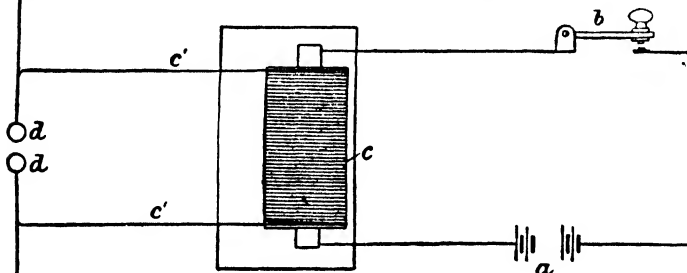


Fig. 4.

the filings are influenced by electric waves or surging, cohesion takes place among the filings, and the tube becomes a comparatively good conductor. This allows a current from the voltaic cell *B* to pass, which is shown by the galvanometer *G*. But on tapping the coherer tube it again becomes of very high resistance so that the

galvanometer indicates no current. Marconi arranges this tapping to be done automatically, as shown diagrammatically in fig. 3. *jj* on the left of the figure is the coherer. It has one terminal joined to earth, and the other terminal is joined to *w*, a vertical wire which acts as resonator to receive the electric waves. *g* is the local cell which works the electromagnet *p* as soon as the coherer becomes a conductor by the electric waves falling on it. The action of the hammer of the electromagnet *p* is to shake the coherer tube and to restore it to its normal high-resistance condition. *r* is another local battery which works the electromagnets of the recording instrument *h*. *k'k'* are two small coils of wire introduced between the coherer and the relay, to compel the oscillating current due to the electric waves to traverse the coherer rather than waste its energy in the path of the relay.

The transmitting apparatus is represented diagrammatically in fig. 4, where *a* is a battery of cells, *b* is a make-and-break key, *c* a Ruhmkorff coil, with its secondary terminals terminating in knobs *d d*. One of these knobs is joined to earth, and the other to a vertical wire *w*. The transmitter works as follows:—When the key *b* is pressed, the current of the battery

is allowed to pass and to actuate the Ruhmkorff coil *c*. This charges the vertical wire *w*, which discharges through the spark gap. This discharge is an oscillating one, and the system becomes a radiator of electric

waves. By keeping the key *b* pressed for a short or a long time it is possible to emit a short or a long succession of waves. How are these short and long succession of waves to be indicated at the receiving station by the apparatus in fig. 3? If it is a short succession of

waves that is sent from the transmitting station, the shake or tap given to the coherer by the hammer *o* in fig. 3 at the receiving station restores the coherer to its normal high-resistance condition, and the Morse instrument or recorder *h* marks a dot on the tape; but if it is a long succession of waves that is

sent from the transmitting station, the acquired conductivity of the coherer is destroyed only for an instant by the tap of the trembler *o* and immediately re-established by the electrical waves, and hence the relay tap and recorder instrument are again actuated, so that a dash is recorded on the tape of the recorder. Thus the recorder is actuated for a time equal to that during which the key is pressed at the

transmitting station. When the key *b* at the transmitting station is kept down short and long intervals, the tape of the recorder at the receiving station records dots and dashes on it. In this way any message can be spelled out by the Morse code, by which all the letters of the alphabet are represented by dots and dashes. A dot represents *E*, a

dash represents T, a dot and dash represent A, and so on for all the letters of the alphabet.

With his new magnetic detector in July, 1902, Marconi succeeded in receiving messages over a distance of 750 miles, with both land and sea intervening. The energy required to transmit signals is found to be proportional to the distance to be covered, and this is found to be greater in the daytime than in the night-time.

**TELEMACHUS**, a son of Ulysses and Penelope. He was still in the cradle when his father went with the rest of the Greeks to the Trojan war. When his father had been absent from home about twenty years, Telemachus was urged by Athēna (Minerva), who appeared to him in the guise of Mentor, a friend of Ulysses, to go and seek him; and as the place of his residence and the cause of his long absence were then unknown, he visited the courts of Nestor and Menelaus to obtain information. He afterwards returned to Ithaca, where the suitors of his mother Penelope had conspired to murder him; but he escaped their snares. His father had arrived in the island two days before him, and was then in the house of Eumēus, a faithful servant; and Ulysses was now assisted by Telemachus in slaying the suitors. The accounts given of the subsequent part of his life are various. (See FÉNELON.)

**TELEOSAURUS**, **TELEOSAURIDÆ**, an extinct genus and family of Crocodilian Reptiles, included in the Amphiœilian division of the order, or that distinguished by the biconcave form of the Vertebrae. The Teleosauridae are found in deposits extending from the Lias to the Chalk or Cretaceous Rocks. *Teleosaurus brevirostris* (upper Lias), *T. Chapmani*, and *T. athenodectus*, are familiar species.

**TELEOSTEI**, a large and important sub-class of the class Fishes, distinguished primarily by the usually bony nature of the skeleton as compared with the cartilaginous skeletons of some other sub-classes. Almost all our common fishes are included in this order; of which the chief sub-divisions are the *Malacopteri* (Eels, Herrings, Pikes, Salmon, Carps, Sheat-fishes, &c.), *Anacanthini* (Sand-eels, Cod, Haddock, Flat-fishes), *Acanthopteri* (Mullet, Gurnards, Mackerels, Wrasses, &c.), *Plectognathi* (Trunk and File Fishes, &c.), and *Lophobranchii* (Sea-horses, &c.). See ICHTHYOLOGY.

**TELEPHONE**, an electric apparatus by which the air-waves representing sounds are in effect transmitted to a distance and the sounds then reproduced. The name electric telephone seems first to have been given to a beautiful and interesting scientific invention of a German schoolmaster, Reis, of Friedrichsdorf, near Frankfort, in which the alternate elongation and shrinking discovered by Joule in a bar of iron when magnetized and demagnetized by the commencement and cessation of an electric current in a coil round it, was taken advantage of to reproduce the notes of a musical instrument played upon in the neighbourhood of a stretched membrane, the latter carrying a light make-and-break mechanism by which an electric current was alternately started and stopped in the course of each period of the sonorous vibration. The iron bar, properly supported in the axis of an electric helix, was pressed endwise against the wood of a violin, and thus the minute to-and-fro motions due to the elongations and shortenings were communicated to a large enough surface to produce a musical sound distinctly audible through a large room. Independently of Joule's discovery, it had been noticed by Page (Poggendorf, *Annalen der Physik*, 1838) and Delezenne (*Bibliothèque Universelle*, 1838), that a bar of iron suddenly magnetized, and then demagnetized by the sudden starting and stopping of a current in

a coil surrounding it, gives rise each time to a short sharp sound like the tick of a watch, which is of course fully explained by the elongation and return shrinking discovered by Joule. Thus the sound made by Reis's telephone has a peculiar character of rattling quite similar to that heard when a piece of card or thin wood is pressed against a rapidly revolving toothed wheel, being in fact a succession of knocks so rapid as to produce the impression of a musical note of definite pitch. The impulses of the air being in opposite directions by the magnetizations and demagnetizations, the period of the disturbance produced by them is that of the magnetization and demagnetization, or of the make and break of the electric circuit, and therefore it is the same as the period in which the membrane is forced to vibrate by the musical instrument. Hence the pitch of the note heard from the magnetic receiving instrument of the telephone is the same as the pitch of the note sounded by the musical instrument. But the quality of the transmitted sound is the telephone's own, and is the same for different musical instruments, whatever be the difference of quality of their sounds. Reis's telephone was quite successful in transmitting the melody of a musical instrument, as for instance a cornopean, to a distance of several miles, and no doubt caused much surprise and delight, rendering it in a sound which was compared to that of a toy trumpet. The first published description of it seems to be of date 1863.

About the same time Helmholtz in his investigations of the theory of sound, and particularly in the construction of his apparatus of tuning-forks for reproducing the vowel sounds, produced another electric telephone (very different from that of Reis), described in his *Timenupfindungen*, of which the first edition appeared in 1863. In Helmholtz's telephone the circuit of a galvanic battery is alternately made and broken by the vibrations of a tuning-fork which (like the hammer of an ordinary electric bell) is kept vibrating by the electro-magnetic action of the intermittent current. The intermittent current transmitted to a distance through a wire is used to excite electro-magnetically one or more steel tuning-forks properly placed between the poles of electro-magnets, of which the coils are connected in circuit. The apparatus by which the current is rendered intermittent is represented in fig. 1 on accompanying plate. A tuning-fork *a* is fixed horizontally between the poles of an electro-magnet *b, b*, and carries at the ends of its prongs two platinum wires *c, c*, which dip into two cups containing mercury covered with alcohol. These cups are formed in the upper ends of two brass pillars fitted with binding screws *i* and resting on two platforms *f, g*, the height of which can be adjusted so as to bring the points of the platinum wires *c, c* in contact with the mercury. One end of the coil of the electro-magnet *b, b* is attached to one electrode of a galvanic battery, and the other end to the binding screw *i*, which communicates through the metal of the fork with another binding screw *e*. A wire connects *e* with one end of the coil of the electro-magnet *b, b* (fig. 2) of the receiving instrument, the other end of which communicates with the other electrode of the battery, thus completing the circuit. A number of resistance coils and a condenser are connected with the circuit in such a manner as to diminish the noise of the spark when the circuit is broken, but need not here be more particularly described. Since the current when flowing passes along the fork from *i* to *e*, the circuit, when the fork is made to vibrate, is broken and re-established every time the platinum wire leaves the mercury in the cup and returns to contact with it.

The electro-magnet *b, b*, the coils of which form part of the circuit, is excited at each passage of the current, and attracting the prongs of the fork till the contact is broken, maintains it in a state of continued vibration. Fig. 2 shows the receiving apparatus. The electro-magnet *b, b* is excited at each completion of the circuit, and attracts the prongs of the tuning-fork *a*, fixed between its poles, thus causing it to vibrate. The sound of the fork is reinforced by bringing near the fork the resonating tube *i*, which corresponds to the note sounded by the fork. The opening of the resonating tube may be partially or completely closed by means of the cover *l*, and thus the sound of the fork made more or less loud, or nearly extinguished, according to the desire of the operator.

An interesting application of Fourier's mathematical analysis shows that any tuning-fork whose vibrational number<sup>1</sup> is equal either to that of the originating fork, or to any multiple of it, is excited by the intermittent current, unless the duration of the 'break' be exactly equal to the duration of the 'make', in which case, supposing for simplicity that the current is uniform during the time that the circuit is made and is absolutely zero during the whole time the circuit is broken, the tuning-forks whose vibrational periods are even multiples of that of the originator would not be excited at all.

Helmholtz used his apparatus to excite vibrations simultaneously in a series of tuning-forks having their vibrational numbers respectively equal to that of the originator and all its different multiples, two, three, four, &c., in order. To equalize the exciting influence on the different forks as nearly as may be, the duration of the current should be either very long or very short in comparison with the whole period, preferably very short.

Helmholtz's method of exciting a tuning-fork or other vibrator by an intermittent current, having its period as nearly as possible equal to that of the vibrator, has been proposed by several independent inventors, with a variety of ingenious and excellent modifications and fresh appliances, to form a system of multiple telegraphy, by which several different messages can be sent simultaneously through one wire. C. F. Varley, in England, in a patent of date about 1870, described how, while the telegraph wire is being employed to transmit messages by an ordinary Morse telegraph instrument, it may also be employed to transmit messages independently by longer or shorter sounds of a vibrator excited according to Helmholtz's principle, and read off by ear as short and long, or 'dot' and 'dash', according to the Morse telegraph code. In the same patent he pointed out that two or more vibrators might be used to give independent messages on the new system in a wire which may also at the same time be employed for the transmission of messages on any of the old plans. A little later, but no doubt quite independently, Elisha Gray and Alexander Graham Bell in America, made a similar application of Helmholtz's principle.

Mr. Gray also gave a beautiful realization of telephonic music, putting to shame the clumsy devices for aerial music of the 'spiritualistic' *stances*. Tuning-forks, each mounted on a resonating box in the usual manner, placed in different positions over a large table of instruments, sounded out the notes and harmonized chords of the *Last Rose of Summer*, to the delighted astonishment of all who saw and heard the seemingly mystical performance, which would have seemed hardly more mystical if, as could easily have been done, the wire by which the subtle influence was conveyed had been made invisible.

<sup>1</sup> A technical name for the number of free vibrations of a tuning-fork per second.

Mr. Bell did not confine himself to multiple telegraphy and to the transmission of melodies and harmonies through the electric wire. With a higher ambition, year after year he endeavoured by various devices to transmit articulate speech. Incited originally by Helmholtz's efforts to reproduce the vowel sounds by combinations of the simple harmonic tones of tuning-forks, and led on by Helmholtz's analysis and theory of the mechanism of the ear, he first designed a 'harp' of elastic vibrators to be used in duplicate, one harp excited by the voice, each vibrator in sympathy with copieric tones in the complex sound constituting articulate speech, the other harp having its vibrators excited electro-magnetically by influence through the wire from the corresponding vibrators of the sending harp. Considering how imperfect is the vowel sound echoed by the strings of a piano excited by a vowel sound sung into it by a loud voice, we could scarcely expect from this ingenious suggestion any very satisfactory approach to the attainment of the great object which Mr. Bell had proposed to himself.

But one very important and well-considered detail of the design embodied the fundamental principle by which in 1876 his great success was achieved. The sending harp was to operate, not by 'makes' and 'breaks' of the line circuit or of circuits connected with it in multiple arc; it was not to operate by make and break at all, as in the experiments of Reis and Helmholtz, but, by continuous electro-magnetic induction, to produce an electromotive force as nearly as may be in simple proportion to the velocity of the vibrator's motion at each instant. Adapt this principle to practice, and you have Bell's articulating telephone. Use a vibrating membrane, or a stiff elastic plate whose gravest fundamental mode of free vibration has a vibrational period small in comparison with that of the acutest qualifying overtone in the sound to be transmitted, and not too massive to be moved sufficiently by the changing pressure of air in the exciting oral vibration. Let the motion of this membrane by electro-magnetic induction or otherwise give rise to a current through the wire in simple proportion to the velocity of the motion at each instant. By electro-magnetic force at the other end of the line let this current reproduce a similar motion in a similar membrane, communicating similar motions through the air to the ear of the listener, and the Bell telephone is complete.

Bell's telephone as originally constructed is shown at figs. 3 and 4 on plate. *s, s* are two terminals in metallic communication with the ends of a coil of fine silk-covered wire surrounding one end of a permanent bar magnet. A thin sheet-iron plate *p* is clamped by a wooden ring pressing it round its edge and holding it in a position with its plane perpendicular to the length, and its centre close to the end of the magnet. One of the terminals *s* communicates through a wire with one of the terminals of the coil of a precisely similar instrument at the other station, the remaining pair of terminals being connected either through the earth or by means of a return wire.

When the instrument is used, the operator, holding the mouthpiece *o* close to his lips, speaks into it, as into a speaking-tube, the message he desires to transmit to the person at the other end of the line. The latter, holding his telephone to his ear, hears an exact reproduction of the message sent, and it is difficult to avoid the impression that it is the actual voice of the speaker that is heard. Fig. 5 shows a modern type of Bell receiving telephone in common use.

In 1877-78 Thomas Alva Edison in America and David Hughes in England invented the microphone,

# TELEPHONE.

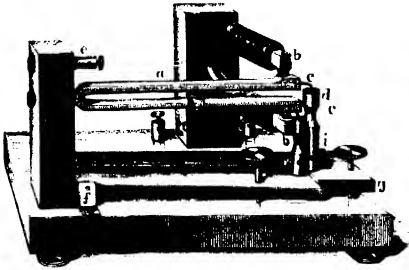


Fig. 1.

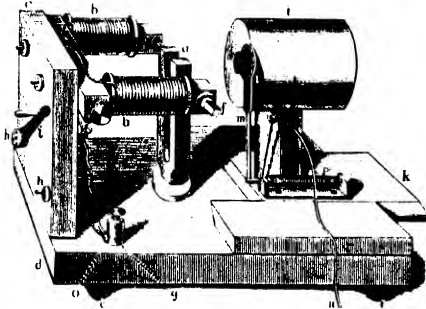


Fig. 2.

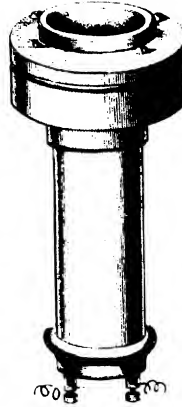


Fig. 3.

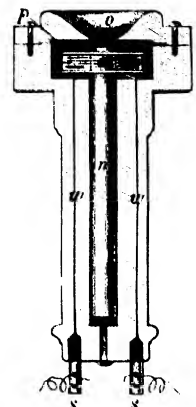


Fig. 4.

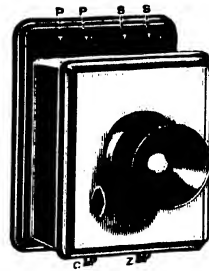


Fig. 6.

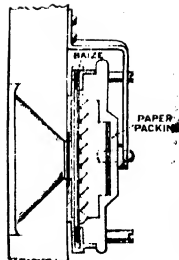


Fig. 7.

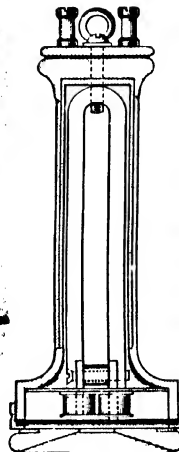


Fig. 5.

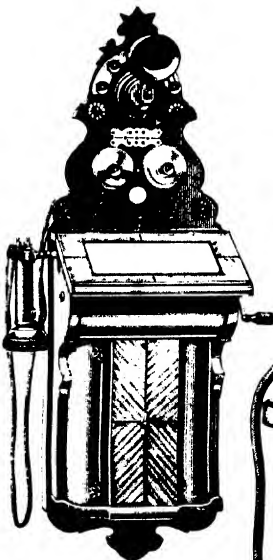


Fig. 9.

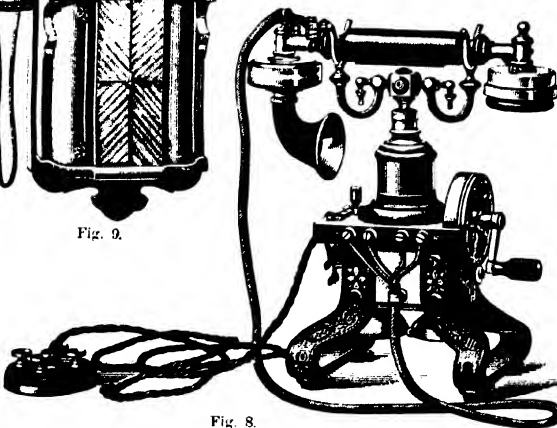


Fig. 8.

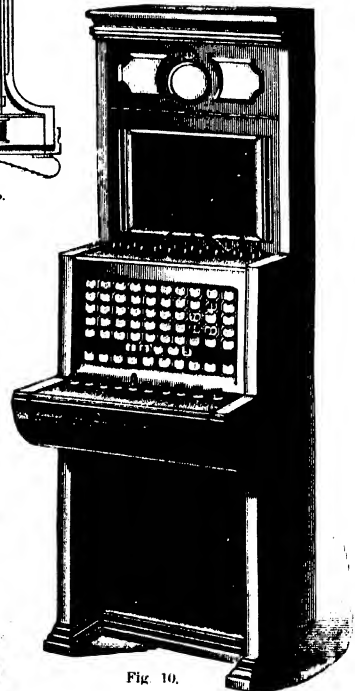


Fig. 10.

Figs. 1, 2. Helmholtz's Telephone Apparatus. 3, 4. Bell's Telephone in its original form. 5. Bell Receiver, modern form. 6, 7. Modern Form of Transmitter, elevation and section. 8, 9. Combined Transmitting and Receiving Telephone, common forms. 10. Switchboard for fifty lines.



and modifications of this instrument are now chiefly used as 'transmitters' for the telephone.

Whilst the electrical transmission of articulate speech dates from the invention of the speaking telephone, which was patented by Bell in America on February 14, 1876, and in this country on December 9 following, practical commercial telephony may be said to date from the invention of the carbon transmitter, patented by Edison in America on July 20, 1877, and in this country ten days later.

The operation of the Edison transmitter is based upon the fact that certain substances, notably carbon, have their electrical conductivity varied in proportion to the amount of external pressure to which they are subjected, and that consequently if an electric current is passed through a mass of such substance upon which pressure can be caused to vary in wave form, the current will likewise vary in a similar manner, thus furnishing the essential elements of a telephonic transmitter.

In taking practical advantage of the above-mentioned physical fact, Edison employed (amongst a number of devices experimented with) a button of compressed lamp-black carbon, so placed behind a disc of mica that the vibrations of the disc varied the pressure upon the button and consequently varied a current flowing through it.

Figs. 6 and 7 (see plate) show in elevation and section respectively a granular carbon form of transmitter now most generally in use.

The commercial practicability of telephonic speech secured by the introduction of the carbon transmitter soon led to the establishment of 'telephonic exchanges', which are now so important a factor in business life. In these exchanges are grouped wires leading from offices and private residences, and switching apparatus is provided by means of which any one wire can be immediately connected temporarily with any other, thus affording prompt means of communication between any two subscribers. A switchboard for fifty lines is shown at fig. 10. It is provided with flexible metallic cords carrying metal plugs at their ends by means of which the connections are made between any two lines. 'Trunk' or 'long distance' wires are also provided, whereby a resident in one town or district may speak to a resident in another. So important has this system of intercommunication become that no town of any importance in any civilized country is without its telephone exchange, and vast numbers of spoken messages are daily passed over the wires. In the United Kingdom alone the annual number of these messages is expressed by hundreds of millions.

In most telephone exchange systems it has been customary to provide, in conjunction with each instrument at the subscribers' stations, one or two battery cells for actuating the transmitter. These are additional to the batteries employed at the exchanges for similar purposes. Recently, however, certain exchanges have been arranged on the 'central energy' system, i.e. a battery placed at the exchange supplies the electrical energy required by the subscribers either for signalling or for speaking and signalling also. In both instances the usual magneto generator is dispensed with at each station; the bell only is required, the signalling being effected automatically by raising the telephone receiver from its rest.

Convenient forms of combined transmitting and receiving telephone sets for office or domestic use are shown at figs. 8 and 9, the former for use on the table or desk, the latter for fixing against a wall.

If wires of sufficient size could be erected at such a distance from the earth as to be practically beyond

the influence of its inductive action, speech by telephone would be practicable for any distance. In practice, however, wires carried on poles are now in daily use affording good speaking over distances of from 1500 to 2000 miles, whilst circuits of 1000 miles in length are common. Above these distances the extra weight and cost of the copper wire necessary are, at present, prohibitory.

In the case of subterranean and submarine circuits the baneful influence of the earth's inductive action is far more pronounced. Thanks, however, to the introduction of cables in which the wires are separated by paper and dry air, whereby the above-mentioned defect is reduced to a very small amount, good talking is obtained on underground wires up to 50 or 60 miles. In the case of submarine cables the problem presents greater difficulty, and talking across the ocean still remains to be accomplished. There appears, however, to be good ground to believe that the desired result will be achieved by taking advantage of what now appears a serious objection, viz., the self-induction of the cable, coupled with a judicious use of artificial leaks to earth, thereby reducing the static capacity of the circuit to a point at which telephonic speech is practicable. This is a field of research which is largely engaging the attention of scientists at the present day.

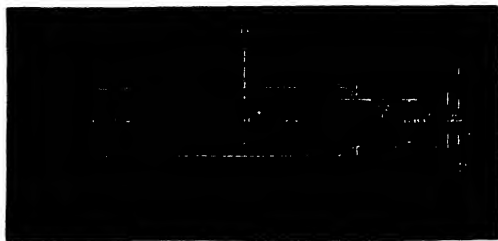
**TELERPETON**, a well-known extinct genus of Lacertilia or Lizards, occurring in rocks which most geologists agree in assigning to the Triassic period. *Telerpeton* remains occur in sandstones in Elgin in the north of Scotland, these rocks being by some geologists referred to the Devonian formations. This genus of Lizards appears to have possessed *acrodont* teeth, or teeth which were attached to the summit of the jaw-bones. The vertebrae also differed from those of existing Lizards in being amphicircular, or hollow at either end, instead of being procircular—that is, concave in front and convex posteriorly. *Telerpeton* appears to present very many characters rendering it a special and highly distinct genus of Lacertilians.

**TELESCOPE**, an optical instrument for enabling us to see distant objects more distinctly than is possible with the naked eye. Telescopes are sometimes described as *terrestrial* and *celestial*; and besides these classes are divided by names into many different kinds, as field-glasses, marine-glasses, &c., and transit instruments, solar telescopes, &c., according as the instrument is specially adapted to a particular use. We shall distinguish in this article two kinds, namely, *refracting* telescopes and *reflecting* telescopes, which have distinct principles of construction, and endeavour to indicate the special forms, which in the most important cases have separate articles devoted to them. A refracting telescope consists essentially of two lenses, namely, an object-glass, the lens nearest to the object viewed, and the eye-piece, at the eye end of the instrument; a tube to shut out all light except that which comes into the instrument from the object; and a sliding arrangement by which the two lenses may be adjusted as to the distance between them. The theory of the refracting telescope will be understood from fig. 1 below—1 and 2 are rays of a pencil proceeding by reflection from the point of a distant arrow, 3 and 4 come similarly from a point at the opposite end of the arrow, and these rays are represented as forming images of the points at *a* and *b* respectively, refracted to these points by the lens or object-glass *o*; rays proceed from these image points and are refracted at the eye-piece *o'*, so that to an eye placed at *e* they appear to proceed from points *A* *B*'. The angle which the distance between the two points *A* and *B* subtends at the eye of



the spectator, equal to the angle between 1 and 3, or 1 or 300 yards,  $o'f$  is the focal distance of the object-glass, and  $o'v$  is that of the eye-piece; magnification is therefore said to be in the ratio of the focal lengths of the two lenses. The magnification will be made greater than this by putting the eye as close as possible to the eye-piece, and shortening the distance  $f o'$  as much as is compatible with distinct vision. It will be observed that the image of the arrow is turned upside down compared with the arrow, and in telescopes where it is of consequence to have the images right side up erecting glasses are employed.  $o'v o''$ , fig. 2, are erecting glasses; their action is sufficiently explained by the figure; the rays of each pencil become parallel between  $o'$  and  $o''$ . Another kind of refracting telescope is illustrated by fig. 3.  $o$  is the object-glass and  $o'$  the eye-piece. This is called the Galilean telescope; and it differs from the telescope described above in having a concave lens for its eye-piece. Rays coming from two points of a distant object, as in the previous case, would form images of those points at  $a$  and  $b$  if the eye-piece  $o'$  were removed; but the interposition of the eye-piece bends the rays so that they appear to an eye in front of it as if they came from the points  $A'$  and  $B'$ . The pencils from  $o$  to  $a$  and  $b$  are converging, but the lens  $o'$  renders the rays nearly parallel, so that  $a b$  is nearly the focal length of  $o'$  distant from  $o'$ . If we consider the angles  $b o a$  and  $b o' a$  we will see, as in the previous instrument, that the magnification is the ratio of the focal lengths of the two lenses. Comparing the form of telescope first described with the Galilean telescope, it will be seen that a real image is formed at  $b a$  in the first kind, and that if an object, such as a fine silk thread, be stretched across the tube at this place it will be seen, by means of the eye-piece, magnified and lying across the image. Such threads (cross wires) are placed in transit telescopes and in instruments used by civil engineers. In the telescopes of spectroscopes also scales are inserted in the principal focus of the object-glass. The Galilean telescope does not admit of this arrangement. In the first kind, on covering up a portion of the object-glass the illumination is merely decreased, the field remains the same; but in the Galilean telescope covering a portion of the object-glass cuts off a corresponding portion of the field. In the first kind an image of the aperture or space filled by the object-glass is formed by the eye-piece, just as the object-glass forms an image of an object at  $a b$ . This image or bright spot is at the proper point for the pupil of the spectator's eye, and the diameter of the object-glass divided by the diameter of this bright spot gives the linear magnifying power (supposing no erecting lenses are employed) when the telescope is adjusted to see distant objects. The concave eye-piece of a Galilean telescope forms no such image. The tube of the first kind is in length equal to the sum of the focal lengths of the object-glass and eye-piece; that of the Galilean telescope is the difference of the focal lengths. Galilean telescopes are much employed as opera-glasses and for field-glasses, and are usually binocular. Reflecting telescopes are telescopes in which an image similar to that formed by the object-glass, of the kind of telescope first described, is formed by a concave reflector made either of an alloy called speculum metal, or of glass ground and polished to the proper form, and covered in front with a thin coating

Fig. 1.



to the angle  $b o a$ , is increased apparently to the angle  $A' o' B'$ , so that apparently the length of the

Fig. 2.



line  $A B$  is increased. Consider the figure  $o a o' b$ , the tangent of  $\frac{1}{2} A' o' B'$  is to the tangent of  $b o a$  as  $f o'$

Fig. 3.



is to  $f o'$ ; and we may say that approximately the angle  $A' o' B'$  is to  $b o a$  as  $f o'$  is to  $f o$ . When the

Fig. 4.



object  $A B$  is a considerable distance away, say 200

of silver. (See SPECULUM.) Fig. 4 represents the Newtonian telescope. The tube of the instrument carries the speculum shown to the right;  $m$  is a plane mirror, and the image is formed at  $a\ b$ ; the eye-piece  $o$  is placed at its focal distance from  $a\ b$ , and the object is seen as at  $a' b'$ . The magnifying power is the focal length of the speculum divided by that of the eye-piece. Different kinds of reflecting telescopes are the Gregorian, in which the eye-piece looks through the centre of the principal speculum, and instead of the mirror  $m$  there is a concave mirror, whose axis is the same as that of the large mirror; the Cassegranian telescope, in which the second mirror or speculum is convex, giving an inverted image as in the Newtonian telescope; and the Herschelian telescope, in which the eye-piece is placed at the mouth of the tube. It is found useful to attach a small telescope having a large field parallel to large astronomical telescopes; this is called the *finder*, because a star or other object is brought into the field of the large telescope by bringing it into the centre of the field of the finder.

TELFORD, THOMAS, a distinguished engineer, was born in 1757 in Eskdale, Dumfriesshire. His parents occupied a humble position in life, and he received his education at the parish school. At the age of fourteen he was bound apprentice to a mason, and on the expiration of his time worked for some period as a journeyman at that trade, but subsequently removed to Edinburgh, and there applied himself to the study of architecture on scientific principles. In 1782 he quitted Edinburgh for London, where he was befriended by Sir William Pulteney, through whom he was appointed surveyor of the public works in Shropshire. He now exchanged his original occupation for that of civil engineer, and in 1790 was employed by the British Fishery Society to inspect the harbours at their several stations, and was afterwards intrusted with the construction of the Ellesmere Canal, to connect the Mersey, Dee, and Severn. In the years 1803 and 1804 the parliamentary commissioners for making roads and building bridges in the Highlands of Scotland, and also for making the Caledonian Canal, appointed Mr. Telford their engineer. Under the former board 1200 bridges, two of 150 feet span, were built, and 1000 miles of new road were made; and under the latter board the Caledonian Canal, of unusually large dimensions, was constructed. Under the road commissioners on the Glasgow, Carlisle, and Lanarkshire roads, thirty bridges, one of 150 feet span, and another 122 feet high, were constructed. Under the same commissioners and local trustees above thirty harbours were built, some of which, as at Aberdeen and Dundee, are upon an extensive scale. At and adjoining to Edinburgh two very lofty and expensive bridges were built from his designs and under his direction. He was also extensively employed in England, superintending the construction of five large bridges over the Severn, the laying down of the Birmingham and Liverpool and Macclesfield Canals, and the execution of numerous important works for the metropolis. In the year 1808 he was employed by the Swedish government to survey the ground and lay out a system of inland navigation through the central parts of that kingdom. The design of this undertaking was to effect what was ultimately accomplished, the connection of the great fresh-water lakes, and to form a direct communication by water between the North Sea and the Baltic. Another visit was paid by him to Sweden in 1813 to inspect the works after they had been commenced, on which occasion he received from the king the Swedish order of knighthood and a portrait of his majesty set with diamonds. The greatest monument of his engineering skill is the Menai Suspension-bridge, connecting

Caernarvonshire with the Island of Anglesea, which was opened on 30th January, 1826, and was among the last works of its designer. He died early in September, 1834, and was interred in Westminster Abbey. He was a man of some literary ability, contributing the articles Architecture, Bridge-building, and Canal-making to the Edinburgh Encyclopædia, and composing a memoir of himself, which possesses much interest.

TELL, WILLIAM, a peasant of Bürglen, near Altorf, celebrated for his resistance to the tyranny of the Austrian governor Gessler or Gäseler. Switzerland consisted of a great number of secular and ecclesiastical districts, belonging partly to the hereditary dominions of the house of Hapsburg, and partly to the German Empire. Albert I., emperor of Germany, a grasping prince, eager to make territorial acquisitions, wished to unite the Forest Towns with his hereditary estates, and proposed to them to renounce their connection with the empire, and to submit themselves to him as Duke of Austria. They rejected his offers, and were in consequence so ill treated and oppressed by the imperial governors that in 1307 Uri, Schwytz, and Unterwalden formed a league under the influence of three brave men, Walter Fürst (Tell's father-in-law), Arnold of Melchthal, and Werner Stauffacher. Tell was also one of this league. Gessler now pushed his insolence so far as to require the Swiss to uncover their heads before his hat (as an emblem of the Austrian sovereignty), and condemned Tell, who refused to comply with this mandate, to shoot an apple from the head of his own son. Tell was successful in his attempt, but confessed that a second arrow, which he bore about his person, was intended, in case he had failed, for the punishment of the tyrant, and was therefore retained prisoner. While he was crossing the Lake of the Four Cantons, or Lake of Lucerne, in the same boat with Gessler, a violent storm threatened the destruction of the skiff. Tell, as the most vigorous and skilful helmsman, was set free, and he conducted the boat successfully near the shore, but seized the opportunity to spring upon a rock, pushing off the barque. He had fortunately taken his bow with him, and when the governor finally escaped the storm, and reached a rocky defile on the road to Küsnacht, Tell shot him dead. The death of Gessler was a signal for a general rising, and a most obstinate war between the Swiss and Austria, which was not brought to a close until 1499. Tell was present at the battle of Morgarten, and is supposed to have lost his life in an inundation in 1350 while attempting to save a friend. Such is the story of William Tell, which has now come to be looked upon as a pure legend. There is no mention of him by any contemporaneous historian; we meet with his name first in the chronicles of the second half of the fifteenth century, and none of the Tell ballads are of an earlier date. Similar stories in regard to the shooting of the apple occur in Saxo Grammaticus the Danish historian, and in Icelandic literature, not to mention the old English ballad of Adam Bel, Clym of the Cloughe and Wyllyam of Cloudele. Besides, the many contradictions between the various personages, dates, and places, and the widely differing representations of the event, show the gradual development of the legend. The untiring industry of historical scholars has not been rewarded by the finding of the name of Tell in the archives and church registers of Uri, and although an uninterrupted series of charters exist relative to the bailiffs or governors of Küsnacht in the fourteenth century, there is no Gessler among them. The Tell chapels were erected or called by his name generations after his death, and the documents which speak of the

assemblage in 1887 of 114 persons who knew him personally, the erection of a Tell chapel in 1888 on the shore of the Lake of Lucerne, where he leaped on land from the governor's boat, are all said to be unworthy of credence. See Hisely's *Recherches Critiques* (1843); Rochholz's *Tell und Gessler in Sage und Geschichte* (1877); Gisler's *Die Tellfrage: Versuch ihrer Geschichte und Lösung* (1895).

**TELLICHERRY**, a seaport of Hindustan, Malabar District, Presidency of Madras, a healthy and picturesque town, containing N. Malabar district court, jail (formerly the citadel or castle), custom-house, churches, government offices, &c. It carries on a considerable trade, the exports consisting chiefly of coffee, cardamoms, and sandal-wood. Pop. (1881), 26,410; (1891), 27,196.

**TELLINA**, a genus of Lamellibranchiate Mollusca, forming the type of the family Tellinidae, which belongs to the section Siphonida of the class, possessing elongated breathing 'siphons.' The family Tellinidae is known by the shell being equivalve for the most part, and free. Well-known species are the *T. radiata*, *T. virgata*, and *T. donacina*. They inhabit all seas, and are first represented in a fossil state in rocks of Oolitic age.

**TELLURIUM**, the name of a metal discovered in 1782, and named by Klaproth, from *L. tellus*, the earth. The principal minerals which contain this element are as follows:—1. *Native tellurium*. It is of a tin-white colour, passing into lead-gray, with a shining, metallic lustre. It yields to the knife, and is brittle; specific gravity 5.7 to 6.1. Exposed to the blowpipe, it melts before ignition, and on increasing the heat it burns with a greenish flame, and is almost entirely volatilized in a dense white vapour, with a pungent, acrid odour like that of horse-radish. It usually consists of tellurium, iron, and gold, the quantity of tellurium varying from 92 to 97 per cent. 2. *Graphic tellurium*, or *sylvanite* ( $\text{AgAuTe}_2$ ). It is steel-gray, generally splendid, but sometimes slightly tarnished externally. It crystallizes in trimetric forms. The crystals are commonly so arranged as to give to the whole row the appearance of a line of Persepolitan characters; specific gravity, 7.9 to 8.3. Before the blowpipe, on charcoal, it fuses into a dark-gray metallic globule, which finally is brilliant and malleable. 3. *Cubic tellurium*. This mineral is essentially a telluride of lead, containing usually about 39 per cent of tellurium and 60 per cent of lead, with a small quantity of silver. 4. *Tetradynite*, a mineral containing tellurium and bismuth ( $\text{Bi}_2\text{Te}_3$ ), frequently associated with sulphur and selenium. Its composition is: bismuth 53 and tellurium 47. It also occurs in nature in *tellurite* or *tellurium ochre* ( $\text{TeO}_3$ ), in *black tellurium* or *nagayagite* ( $\text{Au}_2\text{Pb}_2\text{Te}_3\text{S}_2\text{Sb}_3$ ), and in *white tellurium* ( $\text{AgTe}$ ). Tellurium, which is rather rare, has a silver-white colour and a good degree of brilliancy. Its texture is laminated like antimony; specific gravity varies from 6.1 to 6.33. It is very brittle, and may be easily reduced to powder. It melts when raised to a temperature higher than the fusing-point of lead. If the heat be increased a little it boils and evaporates, and attaches itself in brilliant drops to the upper part of the retort in which the experiment is made. When cooled slowly it crystallizes in forms belonging to the hexagonal system. Tellurium has the symbol *Te*, and the atomic weight 127. It forms three oxides,  $\text{TeO}$ ,  $\text{TeO}_2$ ,  $\text{TeO}_3$ , the two latter acid-forming; and two sulphides,  $\text{TeS}_2$  and  $\text{TeS}_3$ . Tellurium itself closely resembles sulphur in its chemical deportment. It burns spontaneously when heated in contact with chlorine gas, forming two chlorides— $\text{TeCl}_2$  and  $\text{TeCl}_4$ —the former a black and the latter a white solid substance.

**TELPHERAGE**, the name given by Professor Fleeming Jenkin to any system of automatic conveyance effected by means of electricity, more especially to an automatic system of transporting goods on an elevated line by this means. This system seems, from the simplicity of its construction, suitable to half-settled countries where a limited traffic has not yet encouraged the making of roads, railways, and canals. The main feature of the invention is a series of buckets or skips for carrying goods, drawn by a motor (from which they are suspended) along one of two iron rods (the up and down lines) stretched in equal spans over cross-beams carried by braced posts. For the purpose of economizing power each span forms part of an electric circuit which is completed by the two wheels of the motor, the electricity being generated at a stationary dynamo. The speed of the train is regulated by a centrifugal governor, so arranged that when its shaft reaches a certain number of revolutions the revolving weights suddenly fly out and break the contact, falling back and renewing the contact when the speed has fallen sufficiently. A system of blocking is also automatically worked, by which each train keeps a clear space behind itself into which no following train can penetrate. An experimental line erected at Weston in Hertfordshire was 700 feet long, re-entering on itself, so that trains could be run round and round. It consisted of ten 50-foot spans joined by two semi-circular ends, each 100 feet long, over which trains weighing about a ton attained a speed of from 4 to 5 miles an hour. There is claimed for the invention—in addition to its cheapness—its suitability for broken or hilly ground, and the facility with which it can be erected without interfering with agriculture. It might be also used as a means of transport in public works; while the automatic character of the arrangements would allow telpher lines to be run out to sea for a considerable distance, to load and unload ships.

**TEMESVARI**, a town of Hungary, in an extensive marshy plain on the Bega Canal, 75 miles N.N.E. of Belgrade. It consists of the inner town or fortress and of several suburbs. The principal buildings are the R. Catholic cathedral, the Greek cathedral, the synagogue, town-house, &c. The manufactures comprise woollens, oil, paper, tobacco, leather, &c.; and there are grain-mills, distilleries, &c. The trade is important. Pop. (1890), 44,849; (1900), 53,033.

**TEMPE, VALE OF**, a beautiful and celebrated valley of Thessaly, on the Peneus, not far from its mouth, having Mount Olympus on the north and Mount Ossa on the south. It was much celebrated by the ancient poets.

**TEMPERA**. See **DISTEMPER**.

**TEMPERAMENT**, in music. It will be seen, on referring to the article **MUSIC** (p. 308), that the octave from C to C contains two major semitones, two minor tones, and three major tones. Each minor tone contains exactly one major and one minor semitone, but each major tone contains more than one major and one minor semitone, hence the octave cannot be divided into major and minor semitones, because an interval made up of the three commas, that is, the sum of the differences of the three major tones, is less than a minor semitone, for  $53 \times 3 = 159$ , whereas the minor semitone is 178. Of all the ingenious contrivances found out and put in practice no one answers the purpose so well as the division of the octave into twelve equal parts called mean semitones. Supposing the whole interval of the octave to be divided into 3010 parts, each mean semitone contains  $250\frac{1}{2}$ , or in even numbers 251 parts. By means of this division, called equal temperament, we can tune fixed toned instruments such as the organ and piano-forte in such a manner that any sound thereon may

be the *sest* or tonic of the scale; and twelve scales can be performed equally or very nearly equally perfect, differing from each other in pitch only. By this division of the octave we have the following series of differences:—The mean tone is less than the major tone by 9 parts, and greater than the minor tone by 44 parts; the mean minor third is less than the true minor third by 38 parts; the mean major third is greater than the true major third by 35 parts; the mean perfect fourth is greater than the true perfect fourth by 5 parts; the mean perfect fifth is less than the true perfect fifth by 5 parts; the mean minor sixth is less than the true minor sixth by 35 parts; the mean major sixth is greater than the true major sixth by 38 parts; the mean minor seventh is greater than the true minor seventh by 9 parts; and the mean major seventh is greater than the true major seventh by 30 parts. From this we perceive that the greatest imperfections in the concordant intervals occur in the minor thirds and the major sixths, and thus it happens that these chords sounded on fixed toned instruments are always disagreeably out of tune, and the richness of the harmony destroyed or very much deteriorated. The different effects produced by performing a composition on various keys of the organ or piano-forte is due to the circumstance that strict equality of temperament is not rigidly adhered to in practice.

TEMPERAMENTS, those individual peculiarities of organization by which the manner of acting, feeling, and thinking of each person is permanently affected. The ancients distinguished four temperaments—the choleric or bilious, the phlegmatic, the melancholic, and the sanguineous, which derived their names from the supposed excess of one or other of the principal fluids of the human body—bile (*cholē*), phlegm, black bile (*melaina*, black, and *cholē*), and blood (*sanguis*). Cullen admitted of only two temperaments—the sanguine and the melancholic—considering the phlegmatic a degree of the sanguine and the choleric of the melancholic. Of course these temperaments may exist in ever so many different shades. The bilious or choleric temperament is accompanied with great susceptibility of feeling, quickness of perception, and vigour of action; a lively imagination, violent passions, and perseverance characterize the bilious man. These moral characteristics are combined with a dark or sallow complexion, sparkling eyes, and great muscular force. The phlegmatic, lymphatic, or cold blooded temperament is the reverse of that last described; with little propensity to action, and little sensibility; no great bodily strength or dexterity; rather a heavy look; the feelings calm; the understanding moderately good. The phlegmatic man is free from excesses, and his virtues and vices are stamped with mediocrity. The sanguineous temperament indicates a lively susceptibility, with little proneness to action; promptness, without perseverance; a ready fancy; little depth of feeling or thought; changeable, but not violent, feelings and passions; and a tendency to voluptuousness, levity, fickleness of purpose, and fondness of admiration. The sanguineous are distinguished for beauty and grace, and the whole organization is characterized by the vigour and facility of its functions. The melancholic temperament is characterized by little susceptibility, but great energy of action, reserve, firmness of purpose, perseverance, deep reflection, constancy of feeling, and an inclination to gloominess, to ascetic practices, and to misanthropy. It has been laid down as a law that two persons who have the same or nearly allied temperaments should not marry.

TEMPERANCE SOCIETIES, societies established for the purpose of checking or abolishing the

practice of drinking intoxicating liquors. The evil of intemperance is too obvious and dreadful not to be the subject of much anxious observation; but endeavours to restrain it long took no more effective shape than that of individual influence applied to individual cases. The idea of concentrating public sentiment upon it in some form to produce more important results seems to have been first developed if not conceived by some members of an ecclesiastical body called The General Association of Massachusetts Proper, North America. At a meeting of this association in 1811 a committee was appointed to draft the constitution of a society whose object should be 'to check the progress of intemperance, viewed by the association as an alarming and growing evil.' Such a society was formed, consisting of about 120 members, in different parts of the state. It held its first meeting in 1813. The first attempt of the society was naturally to collect facts towards a precise exhibition of the nature and magnitude of the existing evil, with the view of drawing public attention to it and of directing endeavours for its removal. A year after its formation a similar state institution, with numerous branches, was organized in Connecticut, measures of like character were set on foot in Vermont, and an indirect influence from itself was also exerted within its own proposed limits by auxiliary societies, which, according to the report of 1818, had multiplied at that time to the number of more than forty. At the same time, as was to be expected, individuals, by writing and by personal influence, were doing an important part in the same work. Early in the year 1826 a new impulse was given to the movement by the formation in Boston on a more extensive plan of the American Society for the Promotion of Temperance. The Massachusetts Society had now accomplished perhaps the most useful part of all to which it was competent. It had succeeded in fixing attention to its object in a part of the country where effective combination for further operations might be the most easily organized, and by the facts which, with much labour, it had collected and promulgated. It had both furnished guidance to further efforts of the same kind and demonstrated their necessity. The Massachusetts Society had been in great part conducted by individuals belonging to a class of religionists—the Unitarians—whose influence as such was not great beyond a limited circle in New England, and who did not sufficiently command the sympathy of other denominations to be able to produce a combination of Christian action. At the time above mentioned the enterprise was energetically taken up by influential members of other denominations, and the temperance movement rapidly extended. The first annual report of the American Society announced the formation of thirty, and the second of 220 auxiliary associations, five of which latter were state institutions. The number of auxiliary associations was increased in 1829 to more than 1000, no state in the Union now being without one, and eleven of them bearing the names of their states respectively. A decline in the sales of distilled spirits is represented to have generally taken place, varying in different parts reported from one quarter to nine-tenths of the whole amount; and 400 dealers in them were known to have renounced the traffic for reasons of conscience. The next report was presented in the month of May, 1831. More than 2200 societies, embracing 170,000 members, were now in correspondence with the parent society, and from less certain data it was inferred that the whole number of societies existing was not less than 3000, and that of their members 800,000. More than 1000 distilleries had been stopped—a tenth part, as was believed, of all which had been in operation.

Reports of the success of the movement soon crossed the Atlantic, and in August, 1829, the Rev. G. W. Carr succeeded in forming a society at New Ross, Wexford county, Ireland, and about the same time the cause was zealously championed in the north of Ireland by the Revs. Dr. Edgar, Dr. Cook, and Dr. Morgan, and before a year had passed sixty societies had been formed, numbering about 3500. In 1838 a great impetus to the movement was given by the Rev. Theobald Mathew, a Catholic priest, who succeeded in less than two years in persuading about 1,800,000 of his countrymen to renounce the use of ardent spirits. The vow which he imposed on his followers was not of total abstinence for ever from all intoxicating liquors, but only till such time as they should formally signify to him their intention of again becoming drinkers. Though, as might have been expected, a reaction has since taken place in Ireland, following out the general law of all rapid popular movements, there can be no doubt that the character of the Irish as regards temperance has been materially improved of late years, and that much of this moral and social amelioration is to be attributed to the philanthropic efforts of the benevolent clergyman just mentioned. In Scotland the movement was eagerly taken up by John Dunlop of Greenock, a gentleman who had been extensively engaged in the west of Scotland in operations connected with the religious education of the young, the scientific instruction of artisans, savings-banks, missionary and other societies of a benevolent nature. The first temperance society in Scotland was established at Maryhill, near Glasgow, 1st October, 1829; four days later a second was formed at Greenock. The Glasgow and West of Scotland Temperance Society was constituted soon afterwards, and its original roll-book was soon filled with the names of 7486 members, at the head of which stands the name of William Collins, publisher, one of the most vigorous temperance reformers of the time. On the 14th June, 1830, the first temperance society in England was founded at Bradford chiefly through the exertions of Henry Forbes, and by the close of the year there were in existence about thirty societies, numbering about 10,000 members.

Hitherto the members of temperance societies, at least in the great majority of cases, had resolved to abstain merely from ardent spirits, allowing themselves the use of fermented liquors in moderation. But many began to see that it was just as bad to get drunk on beer or wine as on rum, gin, brandy, or whisky. As early as 1817, it is true, a total abstinence society had been formed at Skibbereen, Cork county, but its influence was almost entirely local. In 1830 a society of the same nature was founded at Dunfermline, which was soon followed by others in Paisley, Glasgow, Greenlaw, and elsewhere. In 1832 the war against intoxicating liquors of all kinds was opened in England by Joseph Livesey of Preston. A meeting got up by him and several other Preston gentlemen was addressed by a plasterer's labourer, 'Dicky' Turner, in the following words: 'I'll hev nowt to do wi' this moderation, botheration pledge; I'll be reet down tee-tee-total for ever and ever.' Mr. Livesey and his co-workers took up the word at the moment, for the designation 'abstinence from all intoxicating drinks' was cumbersome, and from that time till now the word *teetotal* has been applied to the sect which adopted the thorough principles. About 1838 the teetotal party triumphed, the old temperate or moderation party having gradually disappeared, its members in the most cases passing over to the total abstinence party. But dissension arose within the camp of this party itself. One section bound themselves not only to abstain from

all intoxicants but also not to give nor offer; this was called the long pledge. The other section omitted the give-nor-offer clause, and was known as the short-pledge party. From 1839-42 the war between the two parties was carried on with great bitterness in England; but after the latter date the long pledgers carried everything before them. The growth of the temperance movement and of temperance sentiment throughout all civilized communities has produced a steadily-increasing demand for some kind of legislative interference with the liquor traffic greater than that existing under the present licensing system. Several states have tried, with more or less success, to meet this demand in various ways, and their experience is of the utmost value as a guide to temperance legislation in the future. A full account, with exhaustive statistics, maps, and illustrations, is contained in the work of Joseph Rowntree and Arthur Sherwell, entitled *The Temperance Problem and Social Reform*, now a recognized authority on the subject of temperance reform. The various plans tried or proposed in different countries may be thus enumerated: (1) State Prohibition, first introduced in Maine and now adopted in several other states of the American Union; (2) Local Prohibition or Local Veto, in force in various districts of the United States and also in parts of Canada; (3) Local Option, which differs from the preceding in permitting reduction of the number of licensed houses and other alternatives; (4) High License, under which licenses are granted to the highest bidders; (5) State Monopoly, as in Russia; (6) The Gothenburg System, fostered in different forms in Sweden, Norway, and elsewhere, under which the public-houses are owned by companies with limited profits; (7) Municipalization, or the ownership and control of all public-houses in an area by the local authority. The authors of the above book declare against (4) and (5), and consider that the experience of the United States and other countries proves conclusively that (1) (2) (3) may be expected to attain a large measure of success in rural and thinly-peopled districts or small towns, but that they fail altogether to reach the core of the problem in large towns. They lay stress upon the necessity of dealing constructively and not merely restrictively with the problem of intemperance, and propound a scheme of adoptive municipalization or public control which avoids the dangers incident to such a course, and has gained the enthusiastic support of most temperance leaders. The agitation for temperance legislation in Britain has hitherto mainly consisted in a demand for local veto or local option. The Licensing Laws Commission, appointed in 1896, issued two main reports of great value, of which that of the minority, signed by the chairman, Lord Peel, has commended itself not only to temperance workers, but also to other sections of the community, as containing a reasonable and substantial contribution towards the lessening of intemperance.

The principal Temperance societies in Great Britain are the National Temperance League, founded in London in 1856; it has an annual income of about £11,000, has for its organs the weekly *Temperance Record* and the quarterly *Medical Temperance Journal*, and employs several lecturers, missionaries, and organizing agents; the United Kingdom Alliance (the Permissive Bill party), founded in 1853, has its head-quarters at Manchester, has a membership of about 90,000, an annual income of £25,000, publishes weekly the *Alliance News*, and sends agents and lecturers to every important place in the kingdom; the Scottish Temperance League was established in 1844 at Falkirk, has its head-quarters in Glasgow; annual income over £7000: weekly organ, *The League*

Journal; the Church of England Temperance Society, organized in 1873: organ, The Church of England Temperance Chronicle; societies in connection with various other religious bodies; the National Band of Hope Union, London: organ, The Band of Hope Review; the Independent Order of Good Templars, a total abstinence friendly society, founded in New York in 1851, with a membership of 600,000: its organs are The Good Templar and The Good Templar's Watchword; the Independent Order of Rechabites, a benefit society of above fifty years' standing, with an available capital of about £456,000: organ, The Rechabite and Temperance Magazine; The Central Temperance Legislation Board, which seeks to promote legislation on the lines of Lord Peel's report; besides many county or district societies, and Bands of Hope (associations of juvenile teetotallers), all of which strive by the giving of lectures, issue of publications, and providing cheap and healthy amusement for the people, to lessen the evils of intemperance.

**TEMPERATURE**, the heat effect which is indicated by a thermometer. When two bodies are in contact, and the flow of heat from the one body to the other is equal—that is, when by contact neither is heated or cooled by the other, they are said to be of the same temperature. A small body, such as a thermometer, placed in contact with a substance, quickly becomes of the same temperature; and a thermometer is so constructed as to exhibit in the expansion of its parts different temperatures. Two bodies may have the same temperature and yet contain very different quantities of heat per unit of mass, so that the temperature of a body is not a measure of its heat. If heat be considered as a motion of the molecules of a body, temperature may be considered a measure of the velocities of the molecules; the total heat is the total energy of the molecules, and takes account of their masses. When air at  $0^{\circ}$  C. is heated  $1^{\circ}$  C., at constant pressure, it expands  $\frac{1}{273}$ , and in cooling  $1^{\circ}$  C. from  $0^{\circ}$  C. it contracts  $\frac{1}{273}$  of its initial volume. Supposing the contraction to be continuous, a volume of air at  $0^{\circ}$  C. on being cooled to  $-273^{\circ}$  C. would contract to nothing;  $-273^{\circ}$  C. is therefore assumed as the absolute zero of temperature. The most convenient zero for practical purposes appears to be the temperature at which ice melts; this is taken as the zero of the scale of Réaumur and of the Centigrade scale. The melting-point of ice varies very slightly with moderate variations of pressure, and is sufficiently constant for all practical purposes. See THERMOMETER.

**TEMPERATURE OF ANIMALS.** Very great variations in the degree of normal temperature are to be noted in the animal series. Thus the average temperature of Mammals is stated at  $101^{\circ}$  Fahr.;  $96^{\circ}$ , as observed in the narwhal, may be accounted a low degree for this group of animals, whilst  $106^{\circ}$ , as noted in a bat, is a high rate. The average temperature of the human body is about  $98^{\circ}6$ , the temperature of the internal parts exhibiting a slight increase to  $99^{\circ}5$ . Birds have the highest temperatures of any animals, the average in this class being  $107^{\circ}$  Fahr., whilst (as in linnets) it may rise to  $111^{\circ}25$ . Below birds animals are named 'cold-blooded,' this term meaning in its strictly physiological sense that their temperature is usually that of the medium in which they live, and that it varies with that of the surrounding medium. Warm-blooded animals, on the contrary, do not exhibit such variations, but mostly retain their normal rate in any atmosphere. When the medium in which cold-blooded animals live becomes greatly heated the temperature of their bodies will cease to respond to the increase beyond certain limits, and remains lower than that of the heated medium. Reptiles give an average tempera-

ture of  $82^{\circ}5$ , that of the surrounding medium being  $75^{\circ}$  (Davy). Lower forms of life than Birds and Mammals, in virtue of their slower circulation and other conditions dependent on or connected with their low temperature, are able to resist changes of temperature which would prove fatal to warm-blooded animals. Indeed any serious disturbance of the functions which tend in the latter to maintain the temperature is usually of fatal nature. The temperature in man is greatly affected by his surroundings. In early life the heat of his body is about  $1^{\circ}$  Fahr. greater than that of the adult. In old age the infantile temperature again persists. The temperature of the female is if anything higher than that of the male. The daily temperature is greatest in the afternoon and least at midnight or in the early morning. By exercise and muscular waste the temperature is raised, especially in the acting muscles themselves. In winter the temperature decreases  $\frac{1}{4}^{\circ}$  to  $\frac{1}{2}^{\circ}$  Fahr. from that of summer. After eating a slight increase of temperature is perceptible; and in many diseased states, as in fevers, very high rates ( $106^{\circ}$ ,  $107^{\circ}$ , to even  $111^{\circ}$  Fahr.) may be recorded.

The production of animal heat is effected by the combination in the body of carbonic acid and water, or more primarily by the combination of carbon, hydrogen, and oxygen. The latter three elements the blood is continually receiving, partly from the food and partly from the lungs; and, as the total amount of these elements is not consumed by the tissues, the excretion and combination of the superfluous amount is devoted to the generation of heat. The blood is necessarily the great distributor of heat to every part of the body, whilst the skin surfaces regulate its degree through the large surface presented for evaporation. The continual chemical change of oxidizable materials is therefore the primary source of animal heat, and the degree of this heat in various animals is regulated by the activity of the respiratory process, as well exemplified in the active respiration of birds and insects. Loss of heat takes place by radiation and conduction from the surface of the body and by evaporation from the skin. (See SKIN.) The lungs also regulate, but in a less marked degree, the production of heat; whilst by the digestion of food the temperature is increased. The influence of the nerves in the maintenance of heat is very marked. By dividing the nerves of a limb the temperature of the limb may be made to fall, and in cases of paralysis a diminution of temperature is invariably seen in the affected parts. The importance of the maintenance of a normal temperature is well illustrated in the case of death from starvation (which see), death in such cases resulting rather from loss of heat than from want of food.

**TEMPERING**, in metallurgy, the process of giving to metals, principally iron and steel, the requisite degree of hardness or softness, especially the process of giving to steel the necessary hardness for cutting, stamping, and other purposes. Nearly every kind of steel requires a particular degree of heat to impart to it the greatest hardness it can assume. If heated and suddenly cooled below that degree it becomes as soft as iron; if heated beyond that degree, it becomes very hard and brittle. The common mode of hardening is as follows:—The steel is overheated, cooled in cold water, and then annealed or tempered by being so far reheated that oil or tallow will burn when applied to its surface; or the surface is ground and polished, and the steel reheated until it assumes a certain colour. For razors, lancets, and tools for metal, the shade of colour is a pale straw-yellow; for penknives, screw-taps, &c., a dark straw-yellow; for axes, chisels, and plane-irons, a brown yellow; for table-knives and shears, yellow tinged with purple;



for swords and watch-springs, purple; for springs and saws, blue; a pale blue tinged with green indicates a temper too soft for steel instruments. Mercury is better adapted to harden steel than water; and so is water containing any acid or salt in solution. Saw-blades are often tempered in brine after being heated in molten lead; sabres are heated in a choke fire of charcoal, and then swung rapidly through the air; mint-dies are hardened in oil. See STEEL.

TEMPLARS, a celebrated order of knights, which, like the order of St. John and the Teutonic order, had its origin in the Crusades. Hugues de Payens, Geoffroi de St. Omer, and seven other knights, established it in 1118 for the protection of the pilgrims on the roads in Palestine. Subsequently its object became the defence of the Christian faith, and of the holy sepulchre against the Saracens. The knights took the vows of chastity, of obedience, and of poverty, like regular canons. King Baldwin II. of Jerusalem gave them an abode in this city on the east of the site of the Jewish temple; hence they received the name of soldiers of the temple, or Templars. Pope Honorius II. confirmed the order in 1128, and imposed on them rules drawn from those of the Benedictine monks, to which were added the precepts of St. Bernard de Clairvaux. The fame of their exploits procured them not only numerous members, but also rich donations. The different classes of this order were knights, squires, and servitors, to whom were added, in 1172, some spiritual members who officiated as priests, chaplains, and clerks. From the knights were chosen marshals and bannerets, priors and grand priors, abbots, &c. The chief of the whole order was the grand-master. The knights wore a white cloak adorned with an eight-pointed red cross (Maltese) on the left shoulder. The war-cry of the order was 'Beauséant.' The grand-master had the rank of a prince, and considered himself equal to the sovereigns of Europe, since the order acknowledged the pope alone as its protector, being independent of any other ecclesiastical or secular jurisdiction, governing itself and administering its estates according to its own pleasure. The principal part of the possessions of the order were in France; most of the knights were also French, and the grand-master was usually of that nation. They established themselves in England about 1185, and took up their head-quarters in that country in Fleet Street, London, at the place still known from that circumstance as the Temple. The conquests of the Saracens compelled them, in 1291, to leave the Holy Land; and they now transferred their chief seat to the island of Cyprus. By this time the wealth and power of the Templars had increased to a great extent, and their arrogance and luxury were in proportion. Rumours were spread respecting their ambitious plans for the overthrow of European thrones, and it was said that opinions at variance with the Catholic faith were fostered in the bosom of the order. At length active steps were taken against the order by Philip IV. of France, who thirsted for their possessions, in concert with Pope Clement V. Under the pretext of consultations for a new crusade, and for a union of the knights Templars with the knights of St. John, Clement summoned in 1306 the grand-master, Jacques de Molay, with sixty knights, to France. After their arrival these and all the other knights present were suddenly arrested, October 13, 1307, by the king's soldiers. Philip seized upon the estates of the order, and ordered the trial of the knights to be commenced without delay. Their accusers are said to have been some expelled Templars, who calumniated the order at the instigation of its enemies. They were accused of apostasy from the Catholic faith, and other charges were brought against them, such as that they worshipped the devil,

practised sorcery, adored an idol called *Baphomet*, contemned the sacrament, neglected confession, and practised unnatural vices, charges which to a large extent were no doubt malicious misrepresentations or absurd calumnies. By means of the most horrid tortures, confessions of crimes which had never been committed were extorted from the prisoners. Many Templars, indeed, confessed whatever their inquisitors wished, since a persevering denial of the crimes with which they were charged was punished with death. In 1310 fifty-four knights, who had denied every crime of which they were accused, were burned alive. Throughout France these victims of tyranny and avarice were treated in a similar way. The other princes of Europe were also exhorted by the pope to persecute the Templars. Charles of Sicily and Provence imitated the example of Philip, and shared the booty with the pope. In England, Spain, Portugal, Italy, and Germany the Templars were arrested, but almost universally acquitted. The Inquisitions at Salamanca and at Mainz (1310) also resulted in the justification of the order. Nevertheless the pope at the Council of Vienne, in Dauphiny, solemnly abolished the order by a bull of March 2, 1312, not in the legal way, but by Papal authority ('per provisionis potius quam condemnationis viam'). The members of the order, according to this bull, were to be punished with mildness when they confessed the crimes imputed to them; but those who persevered in denying them were to be condemned to death. Among the latter were the Grand-master Molay, and Guido, the grand-prior of Normandy, who were burned alive at Paris, March 13, 1314, after they had cited, according to tradition, Philip and Clement to appear before the judgment-seat of God within a year. The pope, in fact, died April 19, in the same year, and the king November 29. The estates of the order were conferred by the Council of Vienne upon the knights of St. John, and its treasures in money and precious stones were assigned for a new crusade. But in France the greatest part fell to the crown, and the pope kept considerable sums for himself. In Spain and Portugal some new military orders were founded, and endowed with the estates of the Templars. In other countries the knights of St. John acquired the rich inheritance of their rivals. The Templars maintained themselves longest in Germany, where they were treated with justice and mildness. See Addison's *History of the Knights Templars*; Woodhouse's *Military Religious Orders of the Middle Ages*; Lea's *History of the Inquisition*; Froude's lectures or essays on the subject; Michelet's *History of France and Procès des Templiers*; and Schottmüller's *Untergang des Templer-Ordens*.

TEMPLATE, or TEMPLET, in architecture and mechanics, 1st, a short piece of timber or stone laid under the bearing of a girder or other beam, to distribute its weight or pressure; 2nd, a mould cut out of a thin piece of wood or metal giving the outline or profile of mouldings, &c., used by workmen as a guide to the form of the work to be executed.

TEMPLE (Latin, *templum*), in architecture, an edifice destined for the performance of public worship. Magnificent temples were erected in ancient Greece and Rome, the Romans often taking the Greek structures for models. The general arrangement of a Grecian temple is described in the article ARCHITECTURE—Grecian Style. The Egyptian temples were also remarkable structures. See EGYPT.

The first Hebrew temple was built by Solomon in Jerusalem (see that article), with the help of a Phœnician architect. It was an oblong stone building, 60 cubits in length, 20 in width, and 30 in height. On three sides were corridors, rising above each other to the height of three stories,

and containing rooms in which were preserved the holy utensils and treasures. The fourth or front side was open, and was ornamented with a portico, 10 cubits in width, supported by two brazen pillars, Jachin and Boaz (stability and strength). The interior was divided into the most holy place or oracle, 20 cubits long, which contained the ark of the covenant, and was separated by a curtain or veil from the sanctuary or holy place, in which were the golden candlesticks, the table of the show-bread, and the altar of incense. The walls of both apartments and the roof and ceiling of the most holy place were overlaid with wood work, skilfully carved. None but the high-priest was permitted to enter the latter, and only the priests devoted to the temple service the former. The temple was surrounded by an inner court, which contained the altar of burnt-offering, the brazen sea and lavers, and such instruments and utensils as were used in the sacrifices, which, as well as the prayers, were offered here. Colonnades, with brazen gates, separated this court of the priests from the outer court, which was likewise surrounded by a wall. This temple was destroyed by the Assyrians, and after the return from the Babylonish captivity a second temple of the same form, but much inferior in splendour, was erected. Herod the Great rebuilt it of a larger size, surrounding it with four courts, rising above each other like terraces. The lower court was 500 cubits square, on three sides surrounded by a double, and on the fourth by a triple row of columns, and was called the *court of the Gentiles*, because individuals of all nations were admitted into it indiscriminately. A high wall separated the court of the women, 135 cubits square, in which the Jewish females assembled to perform their devotions, from the court of the Gentiles. From the court of the women fifteen steps led to the court of the temple, which was inclosed by a colonnade, and divided by trellis-work into the court of the Jewish men and the court of the priests. In the middle of this inclosure stood the temple, of white marble richly gilt, 100 cubits long and wide, and 60 cubits high, with a porch 100 cubits wide, and three galleries like the first temple, which it resembled in the interior, except that the most holy place was empty, and the height of Herod's temple was double the height of Solomon's. Rooms appropriated for different purposes filled the upper story above the roof of the inner temple. This magnificent edifice was destroyed by the Romans in A.D. 70, and for many centuries the long-consecrated height has been occupied by the Mosque of Omar.

TEMPLE, THE, a district of the city of London, lying between Fleet Street and the Thames, and divided by Middle Temple Lane into the Inner and the Middle Temple, belonging to separate societies (see INNS OF COURT), each with its hall, library, and garden; the Outer Temple no longer exists. The name is derived from the Knights Templars, who had their head-quarters in England here. The two temples are separated by a wall from the rest of the city, and have entrance gates which are closed at night. The district, which is extra-parochial, being exempt from the operation of the poor-law, is occupied, with few exceptions, exclusively by barristers and solicitors. In former times the members of the Temple were famous for the masques, revels, and banquets which they gave in their halls. To these entertainments there are many allusions in the old poets; kings attended them, the benchers joined in them, and directed the students to dance. Among the famous members of the Temple may be mentioned Beaumont, Sir Walter Raleigh, John Ford, Wycherley, Congreve, Cowper, Blackstone, Sheridan, Coke, Littleton, Clarendon, Somers, and Eldon. Goldsmith and Johnson had chambers here, and here

Charles Lamb was born, and passed the first seven years of his life.

TEMPLE, SIR WILLIAM, an eminent statesman, the son of Sir John Temple, master of the rolls in Ireland, was born in London in 1628. He was educated at Emanuel College, Cambridge, after which he passed six years in France, Holland, Flanders, and Germany. He returned in 1654, and not choosing to accept any office under Cromwell, occupied himself in the study of history and philosophy. On the Restoration he was chosen a member of the Irish convention, and in 1661 he was returned representative for the county of Carlow. The following year he was nominated one of the commissioners from the Irish Parliament to the king, and removed to London. Declining all employment out of the line of diplomacy, he was disregarded until the breaking out of the Dutch war, when he was employed in a secret mission to the Bishop of Münster. This he executed so much to the satisfaction of the ministers that in the following year he was appointed resident at Brussels, and received the patent of a baronetcy. In conjunction with De Witt he concluded the treaty between England, Holland, and Sweden (February, 1668), with a view to oblige France to restore her conquests in the Netherlands. He also attended, as ambassador extraordinary and mediator, when peace was concluded between France and Spain at Aix-la-Chapelle, and subsequently residing at the Hague as ambassador, cultivated a close intimacy with De Witt, and became familiar with the Prince of Orange, afterwards William III., then only in his eighteenth year. A change of politics at home led to the recall of Temple in 1669, who refusing to assist in the intended breach with Holland, retired from public business to Sheen, and employed himself in writing his *Observations on the United Provinces*, and part of his *Miscellanies*. In 1674 Sir William Temple was again ambassador to the states-general, in order to negotiate a general pacification. Previously to its termination in the Treaty of Nimeguen (in 1678), he was instrumental in promoting the marriage of the Prince of Orange with Mary, eldest daughter of the Duke of York, which took place in 1677. In 1679 he was recalled from the Hague, and offered the post of secretary of state, which he declined. Shortly afterwards he was elected to represent the University of Cambridge in Parliament. In 1681 he retired from public life altogether. He was on friendly terms with William III., who occasionally visited him. His relations with Swift are detailed in the article SWIFT. He died at Moor Park, Surrey, in January, 1699. His *Memoirs* are important as regards the history of the times, as are likewise his *Letters*, published by Swift after his death. His *Miscellanies* consist of essays on various subjects: Gardening, The Cure of the Gout, Ancient and Modern Learning (which provoked much controversy at the time), Health and Long Life, Different Conditions of Life and Fortune, Introduction to the History of England, Poems and Translations, &c. See the *Life of Temple* by Courtenay, two vols. 8vo, 1836, Macaulay's Essay, and Forster's *Life of Swift*, vol. i. 1875.

TEMPLE-BAR, an arched gateway which formerly stood between Fleet Street and the Strand in London; and which divided the city from the liberty of Westminster. It was a structure of the Corinthian order, designed by Sir C. Wren, and built in 1670 of Portland stone. Over the gateway, on the east side, were statues of Queen Elizabeth and James I.; and on the west side, of Charles I. and II. The heads of persons executed for high treason were formerly exhibited on this gate. Here, also, on particular occasions, the corporation of London



received the royal family, the heralds' proclamation, or any distinguished visitors. When the sovereign came in state the lord-mayor here delivered to him the sword of state, which was returned, and after this he rode bareheaded, immediately in front of the royal procession. As the gate seriously obstructed a crowded thoroughfare, it was at last found necessary to remove it in 1878, its site being marked by the heraldic monster, a 'griffin'. It was re-erected at Theobald's Park, Cheshunt.

TEMPLEMORE, a market town of Ireland, in the county of Tipperary, and 28 miles north-east of the town of that name. It is a neat, clean, modern place, with a station on the Great Southern and Western Railway, and a large infantry-barrack, capable of containing 1500 men. There are no manufactures of any consequence, but there is a considerable traffic with the surrounding country. There is believed to have been here a commandery of the Knights Templars, whence the name. Pop. (1891), 2433.

TEMPO (Italian for 'time') signifies, in music, the degree of quickness with which a musical piece is to be executed. This depends, of course, chiefly upon the character of the piece. Generally speaking there are five principal degrees designated by the following terms: *largo*, *adagio*, *andante*, *allegro*, and *presto*; and the intermediate degrees are described by additions. But it may be better to divide the *tempo* into three chief movements—slow, moderate, and quick—which again have several gradations designated by the following Italian words: 1, in the slow movements—*largo*, *lento*, *grave*, *adagio*, *larghetto*; 2, in the moderate movement—*andante*, *andantino*, *moderato*, *allegretto*, &c.; 3, in the quick movement—*allegro vivace*, *presto*, *prestissimo*. If the degrees thus designated are to be modified still more the following words are added to increase the rapidity—*assai*, *molto*, or *di molto più*; and to lessen it the words *poco*, or *un poco*, *non tanto*, &c. Often the predominating time is interrupted, in some passages slackening (*rallentando*, *ritardando*) or quickening (*accelerando*, *stringendo*, *più stretto*), or it is left to the performer's pleasure (*a piacere*), in which case those who accompany often have to guide themselves by the leading performer, which is called *colla parte*. If a more distinct time or the former time is to be resumed, the phrase *a tempo*, or *tempo primo*, is used. Several machines have been invented, by which the time of a piece or a passage can be accurately determined, that most commonly used being the metronome, which consists of a pendulum with a sliding weight set in motion by clock-work. Composers wishing to indicate time by means of this instrument do so in the following way: *M.*  $\text{♩}$  = 100, which signifies that 100 beats of the pendulum, each representing the time of a crotchet, are to occupy the space of a minute; *M.*  $\text{♩}$  = 80, signifying that eighty beats of the pendulum, each representing the time of a minim, must be performed in a minute; and so on. The best measures of time, however, are taste, correct feeling, experience, and judgment.

*Tempo rubato* (Italian, 'robbed time'), delayed time, signifies a species of expressive performance, particularly of slow pieces, in which something is taken from the duration of some notes of the principal voice, and the time, therefore, is not strictly observed; but in the general performance, and in the lower voices, the time is accurately observed.

TENACITY, the measure of the resistance of bodies to tearing or crushing. The resistance offered by bodies to tearing is called *absolute tenacity*, the resistance offered to crushing is called *retroactive tenacity*. We give the tenacities of a few substances in pounds avoirdupois per square inch of section:—

Stones, &c.	Resistance to	
	Tearing.	Crushing.
Brick, red .....	300	800
" fire .....	.....	1700
Cement .....	800	.....
Chalk .....	—	330
Granite .....	—	8250
Limestone, marble .....	—	5500
" granular .....	—	4250
Sandstone, strong .....	—	5500
" ordinary .....	—	3850
Rubble masonry, resistance to crushing about four-tenths of cut stone.		

Metals.	Resistance to	
	Tearing.	Crushing.
Brass, cast .....	18,000	10,500
" wire .....	49,000	.....
Iron, cast (average) .....	16,500	112,000
" wrought, bars and bolts .....	65,000	88,000
" wire .....	80,000	—
Copper, cast .....	19,000	—
" wire .....	60,000	—
Steel bars .....	115,000	—

Timber, &c., Fibres running in the direction of Pressure.

	Resistance to	
	Tearing.	Crushing.
Ash .....	17,000	9,000
Birch .....	11,500	9,360
Box .....	20,000	10,800
Elm .....	14,000	10,300
Fir, red pine .....	13,000	6,000
" spruce .....	12,400	—
" larch .....	9,500	5,500
Hempen ropes .....	14,000	—
Mahogany .....	15,000	8,200
Teak, Indian .....	15,000	12,000
Oak, British .....	15,000	10,000

See also STRENGTH OF MATERIALS.

TENANT, in law, one who occupies, or has temporary possession of lands or tenements, the titles of which are in another. A *tenant-at-will* is one who occupies lands or tenements for no fixed term other than the will of the landlord. Tenancy at will may arise by implication as well as by express words; thus, where a tenant for years continues in possession after the expiration of his term, and pays rent as before, the acceptance of rent constitutes a tenancy at will. The tenancy can be determined either by the lessor or lessee at any time, but where it is determined by the lessor, the tenant is entitled to enter the land afterwards to reap the crops, but not if the tenant himself determines the tenancy. If a lessor determines the tenancy before the rent is due he loses the rent. A *tenant in common* is one who holds or occupies lands or tenements along with another or other persons. Each share in the estate is distinct in title, and on the death of a tenant his share does not fall to the survivors as in joint tenancy, but goes to his heirs or executors. The tenancy may be dissolved by a voluntary deed of partition; by the union of all the titles and interests in one tenant by grant, devise, surrender, or otherwise, or by compulsive partition under a decree in chancery, or under an Inclosure Act. A *tenant for life* (in Scotland, a *lifereiter*) is one who has possession of a freehold estate or interest, the duration of which is determined by the life of the tenant or another. An estate for life is generally created by deed, but it may originate by the operation of law, as the widow's estate in dower, and the husband's estate by courtesy on the death of his wife. Tenants for life are entitled to cut down the timber necessary for the repair of houses and fences on the property, and for firewood in the mansion, but cannot cut down more than is necessary for such purposes, nor can they build houses nor open mines or pits without being guilty of waste. A tenant for life may apply to the Court of Chancery for powers to raise money to drain the lands and make improvements. He is not

bound to pay off the principal of incumbrances affecting the property, but must keep down the interest of such incumbrances. He may convey or demise his tenement, but must not attempt to convey an interest greater than his own. When the estate depends on the life of a third party, the reversioner can insist on this party being produced, as misrepresentations may be made by the tenant that the third party is alive.

**TENANT-RIGHT**, a term employed to express certain claims made by tenants of farms upon their landlords, seldom heard between landlord and tenant in Scotland or England, but frequently used in Ireland. The claims coming under the term are mainly for permanence of occupancy by the same tenant without liability to any other increase of rent than is sanctioned by the general sentiments of the community; and for compensation for permanent or unexhausted improvements made by him on the farm. In Scotland and in the border counties of England farms are generally let on long leases at such rentals as are supposed to indemnify the occupier for any sums he may expend on improvements, and the owner usually binds himself to pay a stated sum as the value of these improvements, should they be found at the expiration of the lease to be of a certain stipulated value. In the greater part of England, however, tenancy-at-will prevails, and the occupier may be thrown out at six months' notice. Were the landed proprietors inclined to use this power arbitrarily and frequently there cannot be the slightest doubt that agriculture would be in a very backward state, as the farmers could not see it to be to their personal interest to effect improvements, but through the good sense of the English proprietors this precarious holding is more apparent than real; it is quite common to find one farm occupied by the same family as tenants at will for centuries. The landlord may, indeed, if the tenant makes improvements, raise the rent, and so make him pay interest on his expended capital, but where important improvements are effected the general feeling of the community would, in by far the greater number of cases, prevent the landlord from taking such an advantage. In Ireland the case used to be different, except as regards Ulster and the north, where compensation for improvements was generally allowed. Owing to the ancient tenure of land as the property of the clans, the people throughout the south of Ireland never thought of identifying the Saxon landholders as owners of the land; they considered themselves the owners, and so strongly did this idea take hold of them that many of the landed proprietors, terrified at the murders and other agrarian outrages that took place, and the sympathy of nearly a whole people with the offenders, never dared to exercise fully their rights of property. Many of the proprietors absented themselves from their estates, which they left to be managed by middlemen or bailiffs; the resident owners were reckless, extravagant, and selfish. Rents were fixed by auction, and owing to the absence of other occupations, the pressure of a redundant population, and the want of capital, which often caused the farmers and even the cottiers to pay the wages of their labourers in land, or what came to the same thing, by permission to cultivate a patch of ground which was generally delivered to them by the farmers ready manured, sums were offered for the tenancy of farms which were far beyond the value of the annual produce of the soil, and of course the tenants were perpetually in arrears. In course of time the advantages of tenant right granted to the Ulster farmers were loudly claimed by the farmers in the other provinces, and the murders and agrarian combination throughout

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the country was but a methodised war to obtain them. At last, under the management of Gladstone and Bright, the Landlord and Tenant Act of 1870 was passed. By it the Ulster tenant-right and other corresponding customs received the force of law; and the outgoing tenant became entitled to compensation. Another similar act was passed in 1881, but the more recent purchase acts have inaugurated a new policy. At present, among Irish tenants and agitators there is a demand for the ending of the system of dual ownership by means of compulsory sale. See IRELAND.

**TENASSERIM**, a maritime division of Lower Birmah, about 500 miles in length, and from 40 to 80 in breadth, comprising the districts of Tungu, Shwegyen, Amherst, Tavoy, Salween, and Mergui; area, 46,730 square miles. The eastern boundary of the district is formed by a range of mountains from 3000 to 5000 feet in height. The coast is for the most part rocky, and off the southern part of it the sea is studded by the innumerable islands, large and small, of the Mergui Archipelago. There are several good harbours on the coast, formed by the mouths of the rivers. Tenasserim is a hilly and densely wooded region, with here and there tracts of arable land. The plains in the north on the Salween and the Sittang are very fertile. The area under cultivation is only about one-fifteenth of the whole; but before the district was taken possession of by the British the whole was a wilderness. All the plains are subject to inundations. The land is rich in iron and in coal of excellent quality; tin also is found almost everywhere, and gold is abundant in the rivers. Hot-springs are numerous. The hot season of the year begins in February, the rainy season in June, and the cold season in October. The chief product is rice, especially in the north; the betel-plant is grown largely in the south. Tobacco is cultivated with care, but only for home consumption. All tropical plants flourish in the highest degree. Nearly 400 different kinds of trees grow in the woods. The teak forests especially appear to be inexhaustible. Next to them in value are the bamboos, bread-fruit trees, and the sapan and sandal-wood trees. The camphor, gamboge, and castor-oil plants are found everywhere; and cloves, cinnamon, nutmegs, and pepper are abundant. Elephants are numerous, as well as several species of rhinoceros, the horns of which form an article of export. The trade of Tenasserim is centred in Moulmein on the river Salween. The native inhabitants of the district belong to various races. The most numerous are the Burmese, but there are also Peguans, Siamese, Karens, and others. In religion they are mostly Buddhists. Tenasserim was at one time connected with Siam, from which, however, it was wrested by Alompra, the founder of the Burmese dynasty. It remained a part of the Burman Empire until it passed into the hands of the British by the Treaty of Yandabo at the close of the first Burmese war in 1826. It was once used as a place of transportation for Thugs from Hindustan. Pop. in 1891, 971,660.

**TENBY**, a parliamentary and municipal borough and seaport of Wales, in the county of Pembroke, on the west side of Carmarthen Bay, on the point and north-east margin of a rocky peninsula, 260 miles from London; generally well built of limestone. It has a fine old church and several other places of worship, town-hall, assembly-rooms, the Welsh Memorial to the late Prince Consort, a museum, &c.; a considerable trade in fish. It is, besides, a bathing-place of increasing importance, celebrated for its fine sands, beautiful scenery (the Castle Hill being the favourite rendezvous), and agreeable climate. An iron pier was opened in 1899. The old walls by

which the town was once defended are still to some extent preserved. Pop. (1891), 4542; (1901), 4400.

**TENCH** (*Tinca*), a genus of Teleostean fishes, belonging to the family of Cyprinidae or Carpi, and distinguished as a genus by having short dorsal and anal fins. There are two small barbules at the mouth, and the scales are of small size. The Tench (*T. vulgaris*) is a familiar denizen of fresh waters, and seems to prefer slow-running and muddy rivers. It feeds on garbage and other material eschewed by its neighbours, and these fishes have been taken fat and well flavoured from very foul waters. In winter they are said to hibernate amongst mud. The colour is a greenish olive on the upper parts, tinted with a golden hue; the same colour prevailing below, but of a lighter shade. The average length is about 12 inches. The flesh is soft and rather insipid to taste. See Plate III. at ICHTHYOLOGY.

**TENDER**, in law, an offer of compensation or damages made in a money action. A tender may be made through an authorized agent, and to make it valid the money must be actually produced. Making a tender may have the effect of freeing the defender from subsequent expenses if the tender is found sufficient. A tender made to one of several joint claimants is held as made to all.

A tender of money for any payment is legal, and is called a legal tender, if made in current coin of the realm, of full weight, in bronze coins to the extent of 1s., in silver coins to the extent of 40s., and in gold to any amount. By act 33 and 34 Vict. cap. x. (1870) it is provided that money issued by the Mint, not called in, and of weight specified in a schedule attached to the act, shall be a legal tender as above. (See SOVEREIGN.) Bank of England notes are a legal tender for amounts above £5 by 3 and 4 Will. IV. cap. xcvi. s. 6.

**TENDER** (naval), a small vessel appointed to attend a larger one, and employed for her service in procuring stores, &c. A tender must be appointed by the admiralty. A naval officer at sea has not the power to fit out tenders on his own account, as his commission does not extend beyond his own vessel. Thus a prize captured by any boat fitted out by a man-of-war will not be deemed her prize, but will be forfeited to the admiralty unless the prize is brought back to the ship, which completes her capture of it.

**TENDON**, the name given to the structures by means of which muscles are inserted upon bones. Tendons are popularly named 'sinews,' and consist of bundles of white fibrous tissue-fibres disposed in elastic bands, arranged side by side, and separated by areolar or connective tissue. The tendons are adapted usually to resist traction in one direction only—that of the muscular motion.

**TENEDOS**, an island of Asiatic Turkey, on the west coast of Asia Minor, 15 miles south-west of the Dardanelles, about 6 miles long and 3 miles broad. The channel which separates it from the mainland is 3 miles broad. Tenedos is rocky, bare, and desert towards the sea, but fertile inland, and has always been remarkable for the excellence of its wines, which are said to retain colour and strength for fourteen or sixteen years. Corn, cotton, and fruits are also produced. On the eastern side of the island, near the sea, is the town of Tenedos. Pop. 6000.

**TENERIFFE**, the largest of the Canary Islands (which see), situated near the centre of the group. It is of an irregularly triangular form, and has an area of about 1000 square miles. It is wholly of volcanic formation, and is composed principally of enormous masses and cones of trachyte, lava, and basalt, which culminate in the Peak of Teneriffe or

Pico de Teyde, 12,182 feet high. The coast is very irregular, and presents an almost uninterrupted series of lofty cliffs. The only good harbour is that of Santa Cruz on the north-east. The most remarkable feature of the interior is the celebrated Peak, the view from the summit of which is one of the most magnificent in the world. The summit forms a crater about half a league in circuit; below this crater is another larger, forming the summit of Mount Chahorra. Only two eruptions have taken place since the colonization of the island by the Spaniards in 1496, namely, in 1706 and 1798. At all times, however, the internal activity of the volcano is indicated by frequent streams of hot vapour. Teneriffe, taken as a whole, bears a considerable resemblance to Mount Etna. Towns and villages, with their fields, gardens, and vineyards, stretch along its base and for some way up its sides; next succeeds a woody region composed of trees, chiefly chestnuts and oaks; still higher up is a wide barren region covered with pumice-stone and blocks of lava. About a seventh of the whole surface is capable of cultivation, and part of this area is of great fertility. The principal productions are maize, wheat, tomatoes, bananas, potatoes, pulse, almonds, oranges, guavas, apples, honey, wax, silk, cochineal, and wine. Tomatoes are the chief article of export, and next in importance are bananas, potatoes, and onions. Santa Cruz is the capital. See CANARIES.

**TENIERS**, DAVID, the name of two of the most celebrated artists of the Flemish school of painting, father and son, both natives of Antwerp, in which city the elder was born in 1582. Having studied under Rubens, he went to Rome, and remained there six years. On his return to his native country he occupied himself principally in the delineation of fairs, shops, rustic sports, and drinking parties, which he exhibited with such truth, humour, and originality, that he may be considered the founder of a style of painting which his son afterwards brought to perfection. His pictures are mostly small. The elder Teniers died in 1649.

His son, born in 1610, imitated the style and expression of his father, whom he much excelled in correctness and finish. He was director of the Academy of Antwerp in 1644. He confined himself principally to the same subject of low humour in his original pieces. The wonderful exactness with which he copied the productions of others deceived even the best judges of the age, and acquired him the appellation of the *ape of painting*. About 1650 he was called to Brussels as painter to the court, and he died there in 1690. Another son named Abraham was also a good painter.

**TENIMBER**. See TIMOR LAUT.

**TENNANT**, WILLIAM, the author of the poem of Anster Fair, was born in 1784 at Anstruther, in Fifeshire. He had the misfortune in infancy to lose the use of both his feet, and continued a cripple through life. After attending school in his native town he was sent in 1799 to the University of St. Andrews, with the view of qualifying himself for the occupation of a schoolmaster. After studying there for two years the further prosecution of his curriculum was put a stop to by poverty, and he returned to Anstruther, where he remained for some time, employing himself in the acquisition of Hebrew and other languages. About 1803 he joined his brother, a corn-factor in Glasgow, who afterwards removed to Anstruther, but the business failed. His poem of Anster Fair, which was printed in his native town, was published in 1811, and takes for its hero and heroine the celebrated Maggie Lauder and Rob the Ranter, immortalized in Scottish song. Its merits were at first, from the obscurity of its birth-place,

almost unappreciated; but having accidentally come into the hands of Alexander Fraser Tytler, Lord Woodhouselee, the little volume was by his means introduced to the literary world; and a flattering criticism of it, which appeared in 1814 from the pen of Jeffrey in the *Edinburgh Review*, established its reputation and made it popular. In 1813 Tennant was appointed schoolmaster at Dunino in Fife, and here, having access to the college library at St. Andrews, he made himself master of the Syriac, Persian, and Arabic languages. Hebrew and Gaelic had many years before been mastered by him. From Dunino he was transferred to a similar situation at Lasswade, and thence in 1819 to the post of teacher of the classical and oriental languages at the newly-established academy at Dollar. Here he continued till 1835, when he was appointed to the chair of oriental languages in St. Mary's College, St. Andrews. He died 14th October, 1848. Besides *Anster Fair* he was the author of a humorous poem entitled *Papistry Stormed, or the Dingin' Down o' the Cathedral*, dealing with the demolition of St. Andrews Cathedral at the Reformation; *The Thane of Fife*, an epic poem describing the invasion of Fife by the Danes in the ninth century and the death of the Scottish king Constantine; and a series of dramas, comprising *Cardinal Beaton*, a tragedy in five acts; and *John Balliol*. None of these, however, attained any success, and they are now almost forgotten. Grammars of the Syriac and Chaldean tongues were published by him in 1840, and a volume of *Hebrew Dramas*, his last literary work, in 1845.

**TENNESSEE**, one of the United States of North America, bounded on the north by Kentucky and Virginia, east by North Carolina, south by Georgia, Alabama, and Mississippi, and west by Arkansas and Missouri; area, 42,050 square miles. Topographically it presents eight natural divisions. (1) The mountain ridges of the Appalachian chain (here called the Unaka Mountains) on the eastern frontier, having an average elevation of 5000 feet above sea-level, and an area of about 2000 square miles. (2) West of this chain is the valley of East Tennessee, having an average elevation above sea-level of 1000 feet. This region (area, 9000 square miles) is agriculturally one of the most important sections of the state. (3) The Cumberland table-land, having an average elevation of 2000 feet above the sea, and an area of about 5000 square miles, abounds in coal, iron, and other minerals. (4) The highlands, or terrace-lands extending from the table-land westwards to the Tennessee river, form a flat fertile plain furrowed by numerous ravines and streams, having an average elevation of 1000 feet, and an area of 9000 square miles. (5) In the centre of these highlands is the great central basin (elliptical, and resembling the bed of a drained lake), 'the garden of Tennessee', having an average depression of 300 feet below the highlands, and an area of 5400 square miles. (6) The western valley of the lower Tennessee and its smaller affluents, having an average breadth of 10 to 12 miles, and an area of 1200 square miles, extends across the state. (7) The great plateau or western slope is a rolling plain inclining gradually to the Mississippi, its mean elevation being about 500 feet, and its area 8800 square miles. (8) The extreme western division comprises part of what is known as the bottoms of the Mississippi; it is a low flat alluvial plain with frequent lakes and morasses, less than 300 feet above the Mexican Gulf, and contains 900 square miles of land of exuberant fertility, in which cotton and grain grow year after year without apparently exhausting the soil. The Mississippi forms the western boundary, and with the Tennessee (see next article) and the Cumberland drains three-fourths of

the state. The Tennessee and the Cumberland are navigable for a considerable distance. The climate is both temperate and healthy, the mean temperature of winter being 37·8°, and of summer 74·4°. The principal grain crops are Indian corn, wheat, and oats. The production of cotton is large, as is also that of tobacco. Flax and hemp are extensively cultivated. The rearing and fattening of live stock are carried on under peculiar advantages, and immense numbers of hogs are fed. The most valuable minerals found are coal, iron, and copper. The area of the coal-field is estimated at 5100 square miles, and the annual output of coal is about 2½ million tons. Iron is found in four distinct belts or areas, and a considerable quantity of pig-iron is produced annually. The copper is found in the south-east corner of the state, and some of the mines are very productive. Excellent marble is found, and extensively quarried; limestone, sandstone, and granite for building purposes, roofing slate, potters' clay, and kaolin are actively worked. Among the other minerals are gold (not found in paying quantities), lead, zinc, baryta, copperas, asbestos, &c. Petroleum, sulphur, chalybeate and salt springs are plentiful. The leading manufactures are iron and steel, cotton and woollen goods, furniture, cars, leather, &c. Besides the facilities for traffic afforded by the navigable streams, internal communication is further kept up by an extensive system of railways. The educational system is in a satisfactory condition. There is a large permanent school fund, whose income with the proceeds of general and local school taxes maintains the public schools, which are free to all persons between the ages of six and twenty-one. At the head of the educational establishments stand the Tennessee University, Knoxville; the Vanderbilt (Methodist) University, Nashville; the University of the South (Episcopal), Sewanee; the Fisk University, Nashville; &c. There is a senate of 33 members and a house of representatives of 99. The chief towns are: Nashville (the capital), Memphis, Chattanooga, and Knoxville. Tennessee was admitted into the Union in 1796. Pop. (1880), 1,542,359; (1890), 1,767,518, including 1,332,971 white and 434,300 coloured; (1900), 2,020,616.

**TENNESSEE**, a river of the United States, formed by the union of two streams in the eastern part of the state of Tennessee, flows south-west, takes a semicircular sweep through the northern part of Alabama, then flows north through the western part of Tennessee and Kentucky, and enters the Ohio, of which it is the largest tributary, about 10 miles below the confluence of the Cumberland. Length, about 1200 miles. It is navigable for about 280 miles for steamers to Florence, at the foot of the Mussel-shoal Rapids, round which there is a canal; and above these rapids there is unobstructed navigation for boats for 250 miles.

**TENNIS**, a game at ball, which seems to have been introduced into England in the beginning of the thirteenth century by persons of rank, who erected courts or oblong edifices for the performance of it. The origin of the name is uncertain. It was a very ancient game in France, and is conjectured by some to have been introduced into Gaul by the Romans. The modern game of rackets is the descendant of tennis. (See RACKETS.) **LAWN-TENNIS**, a modern modification of the game, is played on an ordinary lawn or grass plot. See **LAWN-TENNIS** in SUPP.

**TENNYSON**, ALFRED, LORD, poet laureate, was the third son of George Clayton Tennyson, rector of Somersby, Lincolnshire, and he was born there on the 6th August, 1809. He received his early education from his father, who was a man of high character and many accomplishments, and he was afterwards

sent to Louth Grammar School along with his next elder brother Charles. The two boys had begun to write poetry at an early age, and in 1827 they published (at Louth) a volume entitled *Poems by Two Brothers*, for which they were paid £20. In February, 1828, the two youthful poets matriculated at Trinity College, Cambridge, where Alfred had Whewell as tutor, and among friends A. H. Hallam, Spedding, Thackeray, Monckton Milnes, Trench, Alfred, and others—all to be well-known men in after-years. In 1829 he competed for the chancellor's medal, the subject being *Timbuctoo*, and gained the prize with a poem in blank verse, of more merit than might have been expected from the unpromising nature of the subject. In 1830 he published a small volume entitled *Poems, Chiefly Lyrical*, the publisher being Effingham Wilson, Cornhill, London. About the same time his brother Charles published at Cambridge a volume of *Sonnets and Fugitive Pieces*. The two books were reviewed together by Leigh Hunt in the *Tatler*, and by Professor Wilson in *Blackwood*, the latter being to some extent unfavourable. Notwithstanding adverse criticism it was beginning to be perceived that a genuine poet had appeared, and this belief was confirmed by the new volume published by Moxon in 1832 (but dated 1833), in which were such poems as *A Dream of Fair Women*, *Mariana in the South*, *The May Queen*, *The Miller's Daughter*, *The Palace of Art*, *The Lotus-Eaters*, and *Enone*. The poet's father died in 1830, and he was further profoundly affected by the death in 1833 of his student friend Arthur Henry Hallam. The intense grief which he felt at these personal losses helps to account for the long silence which his muse at this time maintained. He left Cambridge in 1831 without taking his degree, and spent his time with his mother and sisters, or among friends in London and elsewhere. It was to this period that William Howitt refers when he says: 'You may possibly come across Tennyson in a country inn with a foot on each hob of the fireplace, a volume of Greek in the one hand, and a meerschaum in the other'. In 1842 he again published his *Poems* in two volumes, and these contained such new pieces as *Morte d'Arthur*, *St. Simeon Stylites*, *The Day-Dream*, *Amphion*, *St. Agnes' Eve*, *Sir Galahad*, *Sir Launcelot and Queen Guinevere*, *The Vision of Sin*, *Dora*, *Godiva*, *The Talking Oak*, *Will Waterproof*, *Locksley Hall*, *The Two Voices*, and *Ulysses*, together with the short lyrics, *Break, Break, Break*, and *Move Eastwards*, *Happy Earth*. This collection secured wide appreciation, and Tennyson's claims as a poet were publicly recognized when, in 1845, the queen awarded him a civil list pension of £200 a year. It was in the following year that Bulwer Lytton attacked Tennyson in a virulent poem called *The New Timon*. To this there appeared a poetic reply in *Punch*, entitled *The New Timon and the Poets*, in which the poet, under the pseudonym of Alcibiades, handled the critic with scornful severity. In 1847 appeared *The Princess*, a Medley, in blank verse, but the exquisite lyrics scattered through it were first added in the third edition in 1850. These include *Come Down, O Maid*, from *Yonder Mountain Height*; *Blow, Bugle, Blow!*; *Tears, Idle Tears*; *Sweet and Low*; and *Home they Brought her Warrior Dead*. This was followed in 1850 by *In Memoriam*, in which he expressed with epical fulness, and in the most diversified moods of sad reflection, his grief for the death of his friend Arthur Hallam. The stanza in which it was written, though not new, had not been often used before, and it certainly had never been employed with such marvellous power. This poem instantly achieved popularity, and the public recognition made it clear,

when Wordsworth died, that Tennyson was alone qualified to be his successor in the poet-laureateship. After some delay the warrant was accordingly issued for his appointment to this office in November, 1850. It was also in this year that he married Miss Sellwood, of Horncastle—one of the happiest unions that ever poet made. In 1853 they settled at Farringford, Freshwater, in the Isle of Wight, in a house that was to be a home for forty years. From 1868 they had a second home at Aldworth, Haslemere, Surrey. For some years following his marriage the only notable poems which he published were the *Ode on the Death of the Duke of Wellington* (1852), and *The Charge of the Light Brigade* (1854). In 1855 he challenged public opinion with a volume entitled *Maud*, and other *Poems*. The verdict was somewhat unfavourable, chiefly because the sentiments of the speaker of the monologue were regarded as the views of the poet; but he soon afterwards added to his popularity by the series of poems called *Idylls of the King* (that is, the legendary King Arthur), which were begun in 1859. Henceforth the current of his placid life was undisturbed save by the loss of his mother in 1865, various tours at home and on the Continent, and the occasional publication of a volume of poems. The volumes included: *Enoch Arden*, and other *Poems* (1864), among them being *Aylmer's Field*, *The Grandmother*, *Tithonus*, *Sea Dreams*, *The Northern Farmer—Old Style*; the last showing what the poet could do in the field of humorous portraiture; *The Holy Grail*, and other *Poems* (1869), including *Lucretius*, *The Passing of Arthur*, *The Victim*, and *The Northern Farmer—New Style*; *The Window*, or *the Song of the Wrens* (1870); and *Gareth and Lynette* (1872), another of the *Idylls*, which were not completed, however, till the twelfth and last came out in 1885. Soon after 1872 Tennyson sought a new field for his genius; he now produced various pieces dramatic in form. His dramas comprise: *Queen Mary* (1875), *Harold* (1876), *The Falcon* (acted 1879), *The Cup* (1881), *The Promise of May* (1882), *Becket* (1884), and *The Foresters* (1892). Several of these dramas were enacted on the stage, the most satisfactory of the representations being *The Cup*, which was produced at the Lyceum by Sir Henry Irving; and *Becket*, which was produced at the same theatre by the same actor-manager in February, 1893. But it has been admitted, even by the poet's admirers, that his muse was not in any real sense dramatic, and that these dramas did not contribute to his fame, though sufficiently remarkable achievements in a new field. In 1879 *The Lover's Tale* (of which a part had been printed privately in 1833, and another part had appeared in the *Holy Grail* volume) was issued in a complete form; and this was followed by *Ballads*, and other *Poems* (1880), including *The Revenge*, *Rizpah*, *The Defence of Lucknow*, and *The Northern Cobbler*; *Tiresias*, and other *Poems* (1885), including *The Ancient Sage*, and *To-morrow*; *Locksley Hall—Sixty Years After* (1886); and *Demeter*, and other *Poems* (1889), containing *Merlin and the Gleam*, and the fine short lyric *Crossing the Bar*. Some of these latter volumes contain pieces of striking power and vividness of imagination, and carry the poet's art over a wider range. Just when another volume of poetry was announced as ready for publication, the poet died at Aldworth, on 6th October, 1892. He was buried in Westminster Abbey, and the mourning at this event was as sincere as it was universal among the English-speaking race throughout the world. For it was felt that a great poetic artist had brought to a satisfying finish his long task, and that the voice which had made itself

the voice of the English people and of their foremost representative in literature was for ever hushed. The volume of his poems that appeared posthumously was entitled *The Death of Ænone, Akbar's Dream, and other Poems*. The poet was raised to the peerage in 1884, being created Baron Tennyson of Freshwater and Aldworth. In 1897 there appeared a Memoir in two volumes by his son Hallam, very interesting and readable but in some respects inadequate.—His brother CHARLES, above mentioned as joint author with him in the *Poems by Two Brothers*, was born in 1808, and died in 1879. He took the additional name of Turner by royal license on succeeding to property at the death of a great-uncle. He became vicar of Grasby, Lincolnshire, in 1837, and published *Sonnets* (1864), *Small Tableaux* (1868), and *Sonnets, Lyrics, and Translations* (1873). In 1880, after his death, these were republished with additions, under the title *Collected Sonnets, Old and New*. These writings manifest that he possessed a share of his brother's poetic genius. His greater brother regarded some of his sonnets as among the finest in the language.—Another brother, FREDERICK (1807–1898), published several volumes of poems of considerable merit, namely: *Days and Hours* (1854), *The Isles of Greece* (1890), *Daphne and Other Poems* (1891), and *Poems of the Day and Year* (1895).

TENON. See CARPENTRY.

TENOR (in Italian, *tenore*), the highest variety of the natural adult male voice. Its compass generally extends from c in the bass to g or a in the treble. Professional singers may take from c to c. The qualities of the tenor render it suitable to the expression of tender and delicate sentiments. In a vocal composition of four parts the tenor forms the second middle part, deeper than the alto, but higher than the bass; but in the song of four male voices the tenor, as the first voice, leads the chief melody, and as the second is the higher middle voice. The clef of this voice is the C clef on the fourth line of the staff, but the treble or G clef is commonly used, though an octave too high. See also BARTON.

TENT, a portable dwelling-place, formed usually in the simplest manner, of canvas or other fabric stretched with cords upon poles. Tents have been used from the earliest times by nomadic tribes, and by soldiers in their expeditions. In eastern countries they often form permanent residences. In Europe they are seldom used, except for military purposes, or other special purposes, as sometimes by persons on holiday. They are often used by travellers or explorers. The tents of private soldiers in the British service, which are chiefly used in peace manoeuvres, are of a conical form with circular basis, supported by a vertical pole in the centre 10 feet high. The outside diameter of the tent, which accommodates fifteen infantry soldiers, is 17 feet. The officers' marquees, as well as the hospital and laboratory tents, are oblong, and are supported by two upright poles connected by a ridge pole.

TENTACLES, the name applied to the organs so frequently developed in connection with the head and mouth of Invertebrate animals, and which may be used to subserve the sense of touch, to procure food, to seize objects, or to act as respiratory organs. All four functions may be performed by the tentacles in some cases. In the Coelenterate animals, exemplified by the *Hydræ*, the *Sea-anemones*, *Corals*, &c., the tentacles are hollow processes of the body-cavity, and are provided with stinging or thread cells. The tentacles in the *Polyzoa* subserve both respiration and prehension of food particles. In the *Cuttle-fishes* the arms or tentacles surrounding the head are provided with suckers, and are modifications of the 'foot'. In the *Gasteropoda* (Snails,

Whelks, &c.) two or four tentacles bearing the eyes at their tips may exist. The *antennæ* or feelers of insects are tentacular organs adapted to subserve the sense of touch, although other functions (smelling and hearing) may also be performed by them.

TENTERDEN, a market town and municipal borough of England, in the county of Kent, situated on a height, 50 miles south-east of London. It consists chiefly of one main street; and has a spacious and handsome church with a lofty tower, various other places of worship, a town-hall, &c. Pop. (1891), 3429; (1901), 3243.

TENTERDEN, LORD. See ABBOTT (CHARLES).

TENTYRA, or TENTYRIS. See DENDERAH.

TENUIROSTRES, one of the four sections into which the order Insessores of birds is divided. This group, represented by the Humming-birds, Creepers, Sun-birds, Hoopoes, &c., is characterized by the generally elongated bill, which usually tapers to a point; the toes also being usually slender. They feed on fruits, flower-juices, insects, &c. Many of these birds are deficient in the lower or singing larynx (which see).

TENURES. See LAND (TENURE OF).

TEOCALLIS ('houses of God'), the name given to the ancient temples of Mexico, of which there are extensive remains. They are always distinguished by a pyramidal base, square in plan, and rising in stories or terraces, or in an incline of 45°, to an upper platform, on which the temple stands. The most extensive is the pyramid of Cholula, near Mexico, said to have been built before the arrival of the Aztecs. In plan it measures 1440 feet each way, and has four terraces, reaching a height of 177 feet. Its area is nearly four times that of the great Egyptian pyramid, but in strength of material and skill of workmanship it is vastly inferior, and is now merely a mass of ruins. At Palenque, in Yucatan, is a better-preserved temple. The pyramid rises in an incline, consisting of an unbroken flight of steps, 280 feet square and 60 feet high. The temple is 76 feet wide in front and 26 deep, and is ornamented with bas-reliefs in stucco, and hieroglyphic tablets.

TEOS, or TEIOS, an ancient Greek maritime town on the coast of Ionia, in Asia Minor, opposite Samos. It was one of the twelve cities of the Ionian Confederacy and the birthplace of Anacreon. Ruins of a temple, a theatre, &c., may still be seen.

TEPIC, a town of Mexico, capital of the territory of Tepic, 110 miles W.N.W. of the town of Guadalupe, on the slope of a steep hill. It is regularly built, and rendered peculiarly attractive by terraced gardens and pleasant promenades. Being much more healthy than the port of San Blas, about 50 miles to the west, almost all the merchants connected with the port reside in it. Pop. of territory (1900), 149,677; of town, 14,560.

TEPLITZ, or TÖPLITZ, a town of Bohemia, pleasantly situated in a valley between the *Erzgebirge* and *Mittelgebirge*, 30 miles S.E. of Dresden. It contains a castle, with fine park and gardens; a town-church, a town-house, a Rathaus, &c.; but owes all its celebrity to its thermal baths, the most renowned in the kingdom. The springs are of an alkali-saline nature, have a temperature of 99° to 109° F., and are efficacious in cases of gout and rheumatism. The bathing establishment is very complete, and during the season, beginning in May, the town and its newer suburb Schönau are filled with visitors. Pop. (1890), 17,526; (1900), 24,110.

TERAMO, a town of Southern Italy, capital of the province of same name, in an angle formed by the confluence of the Tordino and Vezzo, 30 miles N.N.E. of Aquila. It is the see of a bishop, and has a fourteenth-century cathedral (modernized), with a trade in corn, wine, &c. The ancient city of Interamna stood in the



vicinity, and its site is indicated by the remains of temples, baths, aqueducts, and an amphitheatre. In the plain below Teramo is the ruined castle of San Flaviano, where a very bloody battle, without any decided result, was fought in 1460, between the army of the Duke of Anjou and the Milanese allies of Ferdinand of Arragon. Pop. (1901), 24,578.

**TERAPHIM**, a Hebrew word, of uncertain derivation, which occurs frequently in the Old Testament. It is plural in form, though in use it is applied either to one object or several. It denotes a visible object of idolatrous worship. The earliest mention of teraphim is in Genesis (ch. xxxi. 19), where Rachel is said to have stolen her father's teraphim, which Laban (ver. 30) calls his gods. In the story of Micah (Judg. xvii. 5) the word occurs in our Authorized Version. It was a teraphim that Michal, David's wife, put into the bed (1 Sam. xix. 33) to deceive the messengers of Saul. Josiah is represented (2 Ki. xxiii. 24) as putting away the teraphim. In Ezek. xxi. 21 they are represented as used by the King of Babylon for purposes of divination. The teraphim are supposed to have been human figures, and to have been the object of various kinds and degrees of superstitious reverence, both among those who worshipped the true god and among idolators. They were a species of household gods, which might either be used as aids to devotion or directly worshipped.

**TERATOLOGY**, the division of physiological and anatomical science devoted to the investigation of abnormalities in the structure of animals and plants, and to the determination of the exact nature of the deviation from a normal type of structure. The more important congenital deviations, for example, in the development of the human embryo are described in the article **MONSTER** (which see).

**TERBIUM**, one of a group of doubtful metallic elements similar to cerium, including yttrium, erbium, and ytterbium. They are supposed to occur in the mineral gadolinite found at Ytterby in Sweden in 1794, but the elements occur in such minute quantities, and are so much alike, that their nature and number have not been satisfactorily determined.

**TERBURG** (**TER BORCH**), **GERARD**, a portrait and genre painter, was born at Zwoll, near Overysse, in 1608, of distinguished parents. His father, a historical painter, who had resided some time at Rome, gave him his first lessons in painting. He continued the study of his art at Haarlem, and afterwards visited Germany, Italy, Spain, England, and France, leaving everywhere proofs of his talents as a painter of portraits and of interiors. On the meeting of the European peace congress at Münster he painted in 1648 the assembled plenipotentiaries in one great tableau, which is now in the National Gallery. The Spanish ambassador at the congress took him to Madrid, where he painted the king and many of the nobles. From Spain he went to London, and afterwards to Paris. He then returned to Overysse, married one of his nieces, and became burgomaster of Deventer. He died in 1681. His portraits are remarkable for elegance. He excelled in painting textile fabrics, particularly satin and velvet. His interiors are mostly of the houses of the rich.

**TERCE** is a legal life-rent amounting to one-third of her deceased husband's landed estates recognized by the law of Scotland in favour of a widow who has not accepted of any special provision. Terce is held as a separate possession, and bears its share of the burdens on the estate. To entitle a widow to her terce a legal process called *kenning* her to it has to be gone through. This is a judicial appropriation of it to her by the sheriff of the shire in which it lies.

**TERCEIRA**, an island of the Atlantic, one of the Azores, and near the centre of the group, about

70 miles north-west of St. Michael; greatest length, 20 miles; average breadth, 13 miles; circuit, 60 miles; area, 223 square miles. The coast almost everywhere presents bold and inaccessible cliffs. The interior rises by gentle slopes towards the centre, where it becomes mountainous, and then descends abruptly towards the north-west. The whole surface bears the impress of volcanic agency. Many of the mountainous masses are composed of soft pumice and tuff, and many large landslips have occurred, burying villages and cattle in their fall. The soil possesses very great natural fertility, and heavy crops of yams, grain, and pulses of all sorts are raised with little labour. Fruit also of exquisite flavour is very abundant, and oranges and lemons are raised in large quantity. Cattle and sheep are reared. The capital of the island is Angra, which gives its name to a department including the three islands of Terceira, St. George, and Graciosa. Pop. (1890), 46,528.

**TEREBENTHENE**, a hydrocarbon belonging to the class of the terpenes ( $C_{10}H_{16}$ ), obtained from fresh turpentine oil by neutralizing with alkaline carbonate and distilling. Terebenthene is a colourless liquid, lighter than water; it boils at  $161^{\circ}C$ . By treatment with hydrochloric acid gas it yields two isomeric bodies having the formula  $C_{10}H_{14} \cdot HCl$ ; one of these is a liquid the other a solid. Terebenthene yields a number of hydrates when treated with water. See **TURPENTINE**.

**TEREBRANTIA**, a term used by some entomologists to denote a section of Hymenopterous insects distinguished by the possession of an abdominal ovipositor, which is used as a boring organ in the deposition of the eggs. The term has been also given to a section of insects allied to the Homoptera, in which a boring organ is similarly developed. This latter organ is merely a modification of the abdominal appendages of these insects, and in other cases is further modified (as in Bees, &c.) to form the *aculeus* or sting (which see).

**TEREBRATULA**, a familiar genus of shells, belonging to the Brachiopod class (see **MOLLUSCA**), and forming the type of the family Terebratulidae, which in turn belongs to the Articulate section of the class, or that in which the valves or halves of the shell are united by a hinge. The shell in Terebratula exhibits a punctated structure, due to the presence of numerous minute canals in the shell-structure itself. The ventral or lower valve has a prominent 'beak,' which is perforated by a hole or aperture through which a muscular stalk or *peduncle* issues for the attachment of the shell to fixed objects. A peculiar apparatus of limy loops exists within the dorsal or upper valve of the shell, and serves to support the two elongated arms which stretch away from the sides of the mouth in all Brachiopoda. Terebratulæ still exist in our seas and oceans, *T. Australis* being a familiar species. The genus first occurs in the Devonian rocks, and there are many extinct and fossil species. An allied genus, *Terebratella*, is also still existent, and first appears in the Cretaceous rocks. See Plate II. at **MOLLUSCA**.

**TEREDO**. See **SHIP-WORM**.

**TEREK**, a river which descends from Mount Kasbek, on the north side of the Caucasus, in Circassia, flows first north-west in a narrow valley, then in an easterly direction till it enters the Caspian by a number of branches; total course, about 300 miles.

**TERENCE**, or **TERENTIUS** (*Publius Terentius Afer*), the celebrated Roman comic writer, was born in Africa (whence his surname *Afer*), B.C. 195, and while a child was bought by Publius Terentius Lucanus, a Roman senator, who took him to Rome and gave him a good education. His master having emancipated him the young African now assumed the name

of his benefactor, and soon acquired reputation and friends by the talents which he displayed in his comedies. Lælius and Scipio Africanus (the destroyer of Carthage and Numantia) admitted him into their intimacy; and some accounts aver that they assisted him in the composition of his plays. About the year 161 he went to Greece, where he translated 108 of Menander's comedies. According to some accounts he died in Greece, according to others he was drowned on his passage back to Italy. His translations are said by the popular account to have been lost at the same time. They were probably materials for future works of his own. Six comedies of Terence's alone are extant, and these are all he is known to have produced—the *Andrian*, the *Eunuch*, *Heautontimorumenos*, or the *Self-tormentor*; *Phormio*, or the *Parasite*, *Hecyra*, or the *Stepmother*, and the *Adelphi*, his last piece, brought out in Rome the year before his death. The comedies of Terence were much admired by the cultivated Romans, and were likewise esteemed for their prudential maxims and moral sentences. If we compare him with his contemporaries he will be found to have been much in advance of them in point of style. His language is pure; but in originality of imagination he is inferior to the Greeks and to his predecessor Plautus. Most of his plays follow closely the originals of Menander, but from the fragments of Menander which remain they do not appear to be mere translations. Among the best editions of his works are those of Bentley (*Cantab.* 1726), Wagner (*Cambridge*, 1870), Umpfenbach (*Berlin*, 1870), and Dziatzko (*Leipzig*, 1884). The comedies of Terence have been translated into English by the elder Coleman and several others.

**TEREUS.** See *PHILOMELA*.

**TERLIZZI**, a town of Italy, in the province of Bari, 19 miles south-east of Barletta. It contains a palace, with a good collection of pictures; two churches, one of them enriched by some pictures of Titian; two monasteries and a nunnery. Pop. 20,000.

**TERMINI**, a town of Sicily, in the province of and 23 miles S.E. of Palermo, on a height in a rich and well-cultivated district, near the mouth of the river San Leonardo, which falls into the Tyrrhenian Sea. There is a good museum of local antiquities. It exports corn, oil, olives, and other products of the district. An active fishery also is carried on. It has thermal saline baths, which were well known to the ancients. Pop. 23,000.

**TERMITES.** See *NEUROPTERA*.

**TERMONDE.** See *DENDERMONDE*.

**TERMS**, in law, are the periods during which, previous to the passing of the Supreme Court of Judicature Act, the law courts at Westminster were open for the administration of justice. There are four terms in each year, namely, Hilary Term, which begins on the 11th and ends on the 31st of January; Easter Term, which begins on the 5th of April and ends on the 8th of May; Trinity Term, which begins on the 22d of May and ends on the 12th of June; and Michaelmas Term, which begins on the 2d and ends on the 25th of November. See *SUPREME COURT OF JUDICATURE*.

**TERN** (*Sterna hirundo*), or SEA-SWALLOW, a genus of Natatorial or Swimming Birds, included in the sub-family Sternine, which in turn forms a subdivision of the Laridae or Gull family. The Terns are distinguished by the long, slender, and straight bill, and by the narrow nostrils, which exist at its base. The wings are long and pointed, and the tail is forked. The typical genus *Sterna* has plumed nostrils, and the first quills are the longest in the wings. The hinder toe is very short and free, the front toes being united by a web or membrane. The legs are relatively shorter than in the Gulls. The

Common Tern or Sea-swallow is a familiar visitant of British coasts. It is a very active bird, seeming to have a ceaseless flight, and feeding upon small fishes. Its average length is 15 inches, the long forked tail constituting a considerable element in this measurement. The colour is black on the head and neck, and ashy gray on the upper parts generally. The under parts are white, the legs, feet, and bill being red. These birds leave the shores of Britain in September, and return in the succeeding May. The cry is noisy and jarring.

**TERNATE**, one of the Molucca Islands. See *MOLUCCAS*.

**TERNI** (ancient, *Interamna*), a town of Italy, in the province of Perugia, on an island formed by the Nar, 49 miles north by east of Rome. It is the see of a bishop; and has a handsome cathedral, several other churches and convents, and some Roman antiquities, the principal of which are the remains of an amphitheatre. But the chief object of interest which has made Terni familiar to Europe is the celebrated Falls of Velino or Terni, about 5 miles distant from it. They are artificial, having been originally formed by the Romans to carry off the surplus waters of the Velino, which were constantly inundating the rich plains on its banks. The whole height, not less than 800 feet, properly forms three separate falls—the upper of 50 feet, the second or perpendicular fall of about 550 feet, and the third fall of 240 feet—forming a long sheet of foam. Their magnificence is unrivalled in Europe. Terni is one of the most thriving and industrial towns of the country; and has important manufactures of woollens and silks. The historian Tacitus and the emperors Tacitus and Florian were born here. Pop. 12,419.

**TERNSTROMIACEÆ**, the Tea family, a natural order of plants, consisting of exogenous trees or shrubs, with simple, alternate, coriaceous leaves, generally without stipules, sometimes dotted, deciduous, and usually undivided; petals five, six, or nine, not equal in number to the sepals, often combined at the base; stamens indefinite, hypogynous, filaments free or united at the base into one or more parcels; anthers versatile or adnate, 2-celled, opening longitudinally; ovary superior, with several cells; styles from 2 to 7, filiform, more or less combined; ovules pendulous, or erect, or peltate; fruit either a capsule, 2 to 7 celled, opening by valves, or coriaceous and indehiscent; seeds attached to the axis, very few and large; cotyledons very large, and often containing oil. There are thirty-three genera and 180 species enumerated. They are found in South America, India, China, and North America. Tea is produced from two or three species or varieties of one species of the genus *Thea*. The Camellia belongs to this order.

**TERPSICHOE** ('she who loves dancing'), one of the Muses, the inventress and patroness of the art of dancing and lyrical poetry. She is generally represented with the tambourine (*tympnum*), crowned with flowers, and in a mirthful attitude.

**TERACINA** (ancient, *Anxur*), a town of Italy, in the province of Rome, on a gulf of the same name, near the south-eastern extremity of the Pontine Marshes. It is the see of a bishop; and has a handsome episcopal palace; a cathedral, in a kind of Italo-Byzantine style, on the site of an ancient temple which has furnished several of the pillars. There is a small port at the termination of the Canal of Terracina, with about 6 feet of water, but the trade is very insignificant. The fishing, however, is active. Pop. 9000.

**TERRA COTTA** (Italian), baked clay or burned earth, frequently used at an early period for the architectural decoration of a building. Many statues of deities, bas-reliefs, lamps, vessels, &c., were also



formed of this material. Terra cotta is now much used in place of stone in the more ornamental parts of buildings. It is made by mixing a suitable clay with ground glass, pottery, or sand, grinding the whole to powder, soaking in water, straining, drying, and baking in a kiln. For building purposes it is made up into blocks, usually hollow, and often containing broken brick held in place by mortar or cement. It is entirely unaffected by the atmosphere, is light, strong, and hard, and costs less than the best building stone.

**TERRA DEL FUEGO.** See **TIERRA DEL FUEGO**.

**TERRA JAPONICA.** See **CATECHU**.

**TERRANOVA**, a town of Sicily, in the province of Caltanissetta, and 30 miles S.E. of Caltanissetta. It was founded in the thirteenth century by the Emperor Frederick II. on the site of the ancient Gela; is defended by a castle, and contains several handsome churches. It exports corn, wine, fruit, and particularly sulphur and soda. Pop. 18,000.

**TERRAS.** See **CEMENT**.

**TERRE-HAUTE**, a town of the United States, capital of Vigo county, Indiana, on the Wabash river, and Wabash and Erie Canal, and at the junction of several railways, 73 miles west of Indianapolis. It occupies a high bank about 60 feet above the river; is well built, mostly of brick; and has numerous churches and schools, a fine court-house, town-hall, United States building, polytechnic institute, state normal school, a women's college, Roman Catholic seminary, opera-house, &c., manufactures of agricultural implements, carriages, and soap; foundries, breweries, distilleries; oil, saw, and flour mills; and a considerable trade, partly in hogs. There are rich beds of coal and iron in the vicinity. Pop. (1890), 30,217.

**TERRESTRIAL MAGNETISM.** See **MAGNETISM (TERRESTRIAL)**.

**TERRESTRIAL REFRACTION**, the refraction of rays of light in the atmosphere of the earth. Consider a horizontal plane, and the atmosphere, which gradually becomes less dense according to its height above the plane. A ray of light at first parallel to the plane will be curved towards the plane; for if we consider two points of the wave front, one nearer the plane than the other, the higher one, being in a medium somewhat rarer than the medium of the lower one, will progress more rapidly than the lower point of the wave front. Rays of light horizontal at first are more curved than any other, and the curvature decreases as the inclination to the vertical decreases. In virtue of the refraction of the earth's atmosphere stars appear nearer the zenith than they really are.

**TERRIER**, the name of several small breeds of dogs. Terriers were originally used for unearthing the fox and for killing rats and other vermin, and several kinds are still employed in these and similar occupations. Some are good watch-dogs, and others are useful as retrievers. The most popular variety is the Fox Terrier, which came into fashion about 1863. It is generally white, with a smooth, dense, hard coat; its chest is deep and not broad; neck fairly long; nose black; ears small, V-shaped, pendulous. The maximum weight is about 20 pounds, and at present the tail is usually docked. There is also a wire-haired variety of the Fox Terrier. The Bull Terrier, for show purposes all white since 1860, is a larger animal produced by crossing a terrier with a bull-dog. It has a long, tapering head, black nose, long and slightly arched neck, wide and deep chest, short, close, stiff, glossy coat, and a comparatively short, tapering tail. The Irish Terrier, a trifle larger than the Fox Terrier, is of a reddish-

yellow, wheaten, or light-brown colour inclining to gray, with a hard, wiry coat free from silkiness. Its chest is deep and not too wide; head long and flat; nose black; ears V-shaped and pendulous; neck long and slightly arched; and its tail docked and carried high. The Scotch Terrier, a smaller animal, has a rather short, wiry, very dense coat of various colours, such as steel-gray, brindle or grizzled, black, sandy, and wheaten. It has a tapering muzzle, black nose, small, prick or half-prick, sharp-pointed ears, short, thick neck, broad and deep chest, uncut tail carried high with slight bend. The Skye Terrier, the smallest of useful terriers, may be of any colour. Its coat is double, the under part consisting of short, close, soft hair, and the outer part of long, hard hairs, free from curl or crisp. It has a long head, black muzzle, prick or pendent ears, deep chest, long and gently crested neck, and short legs, and its tail may be carried either high or low. The Clydesdale or Paisley Terrier is a kind of prick-eared, silky-coated Skye Terrier. One of the newest varieties is the Welsh Terrier, about the size of the Fox Terrier, with a close, wiry coat of a black-and-tan or black, grizzle, and tan colour. There is also an English White Terrier, not unlike a small Bull Terrier. The Dandie Dinmont variety is a favourite small one, of a pepper or mustard colour, with a moderately long coat consisting of hardish and soft hair mixed, but without wiriness. Its large head is covered with soft, silky hair; nose black or dark; ears large and pendulous; tail of moderate length, with a regular upward curve. The Bedlington Terrier is a slightly larger form, somewhat similar to the Dandie Dinmont. The Black-and-Tan or Manchester Terrier has the head long, flat, tapering; nose black; ears small, V-shaped, hanging; neck long and tapering; chest narrow and deep; tail of moderate length, tapering; coat close, smooth, short, glossy; colour jet-black and mahogany tan in different parts. One of the largest of the terriers is the Airedale, with pendulous ears, deep chest, high tail, hard and wiry coat, lying straight and close, and of a tan, black, or dark grizzle colour. The Yorkshire Terrier is the best known of the small toy terriers. See R. B. Lee's *Modern Dogs* (1896).

**TERROR, REIGN OF.** See **FRANCE—History**.

**TERSCHELLING**, an island of the Netherlands, 10 miles off the coast, between the islands of Vlieland and Ameland. It is about 15 miles long north-east to south-west, and 3 broad; flat and sandy, exposed in some parts to inundation. There are some good arable and pasture lands, but the inhabitants are chiefly pilots and fishermen. Pop. 4000.

**TERTIAN FEVER.** See **AGUE**.

**TERTIARIES.** See **ORDERS (RELIGIOUS)**.

**TERTIARY FORMATIONS.** See **GEOLOGY**.

**TERTULLIAN** (*Quintus Septimius Florens Tertullianus*), the earliest Latin father of the church whose works are extant. He was a native of Carthage, son of a proconsular centurion, flourished chiefly during the reigns of Septimius Severus and Caracalla (A.D. 193—217), became a jurist at Rome, was converted to Christianity, but latterly gave up the orthodox faith and went over to the Montanists, who on most points of doctrine were at one with the orthodox Christians, though they were distinguished by greater austerity in manners and severity in discipline. (See **MONTANUS**.) He lived to a great age, and wrote many works. Among works probably written while he was a member of the church are *De Penitentia*, and *Ad Uxorem*, containing advice to his wife not to marry again after his death, and especially not to marry a heathen. Among works written after he became a Montanist are *Adversus Marcionem*, written against

the Gnostics; *De Anima*, a philosophical treatise of Stoical tendencies; *De Carne Christi*, asserting against the Gnostics the reality of the incarnation; *De Resurrectione Carnis*, of the reality of the resurrection of the body; *Adversus Praxeam*, against the heresy of the incarnation of the Father; *De fuga in persequutione*, against the orthodox opinion that Christians might save themselves from persecution by flight; *De Jejuniis*, a defence of Montanist austerities; *De pudicitia*, against granting absolution to those who had fallen into unchastity after marriage. Works probably, but not certainly written after he had become a Montanist, are such as *De Spectaculis*, against Christians attending the public games; *De Idolatria*, against unlawful compliances with heathen usages—in this work he declares that no true believer can accept any public office or serve as a soldier in the armies of the state. To what period of his life the most celebrated and most elaborate of his works, the *Apologia*, belongs is not certain. This is a formal defence of Christianity addressed to the Roman magistrates. He repudiates the charges of atheism and immorality brought against the Christians by the vulgar, and retorts upon the heathen. Among other works whose period is not known is *Adversus Hermogenem*, in which Tertullian held with the Stoics the doctrine of the materiality of the divine nature; but in this treatise he maintains the doctrine of the creation of the world out of nothing as opposed to the eternity of matter *per se* maintained by Hermogenes, a convert from Christianity to Stoicism.

The works of Tertullian display great learning, impetuous energy, force of imagination, and keenness of wit, along with the worst faults of style bred by a degenerate literary taste, abounding in extravagant metaphors and in hyperbolic language. His works are chiefly valuable for the light they throw on the doctrine and discipline of the church in the age in which he lived. The first edition of the collected works of Tertullian was printed at Basel by Frobenius (folio, 1521), and contained twenty-three treatises; the Venice edition of 1744, though containing numerous typographical errors, is one of the best. The *Apology* of Tertullian has been frequently translated. A translation of the works of Tertullian has been published in Edinburgh (in three vols. 8vo, 1868-70).

**TESCHEN**, a town of Austrian Silesia, on the right bank of the Olsa. There are several churches and a Catholic and a Protestant gymnasium. The inhabitants carry on some commerce in wood, spirits, beer, iron wares, and yarn. There is a flax and cotton spinning mill, and a considerable establishment for printing books. In the year 1779 (May 13) a treaty of peace was concluded here between Maria Theresa and the King of Prussia, Frederick II., which put an end to the Bavarian war of Succession. Pop. (1890), 15,109.

**TESSELLATED PAVEMENT** (Latin, *tesella*, diminutive of *testera*), a pavement of rich mosaic work, made of curious square marbles, bricks, or tiles, in shape and disposition resembling dice. Various ancient specimens of these have been from time to time exhumed in Italy and other countries of Europe.

**TESSIN**. See **TICINO**.

**TEST ACT**. See **CORPORATION AND TEST ACTS**.

**TESTAMENT**. See **WILL**.

**TESTAMENT, OLD AND NEW**. See **BIBLE**.

**TESTING**, the process of examining various substances by means of chemical reagents, with the view of discovering their composition. The name testing is usually confined to qualitative examinations—that is, to such examinations as seek to determine what chemical elements or groups of elements are contained in any substance, without inquiring as to the

quantity of these elements. Testing is carried out either by the application of chemical reactions to solid substances, or by the application of reagents in solution to a solution of the substance under examination; the former method is spoken of as testing in the dry way, the latter as testing in the wet way. The most important methods of testing in the dry way are the blowpipe method, and Bunsen's flame reactions; in the wet way the metals are divided into five groups, each having one characteristic property, and these are further subdivided into classes.

**TEST-PAPERS**, slips of unsized paper soaked in solutions of vegetable colouring matters, used as indicators of the presence of acids or of alkalies, and, in some instances, of special chemical compounds. The most common test-papers are litmus and turmeric papers; the former papers are coloured with an aqueous solution of a blue substance obtained from various species of lichens, the latter with a solution in spirit of a yellow powder obtained by grinding the roots of a species of *Curcuma* cultivated in India and Java. Blue litmus is reddened by acids, the blue colour being again restored by alkalies; turmeric is turned brown by alkalies.

**TETANUS** (from Greek *teino*, I stretch), a spasmodic rigidity of the whole body. The body becomes stiff, the breathing heavy, but the senses remain uninjured. If the lower jaw is drawn to the upper with such force that they cannot be separated the disorder is called *lock-jaw* (*trismus*).

**TETRARCH** (Greek, *tetrarches*), a title which originally signified the governor of the fourth part of a country. Thessaly was anciently divided into four tetrarchies. By the Romans the title was used to designate a species of tributary rulers inferior in dignity to kings.

**TETUAN**, a town of Morocco, on the northern coast of Africa, 33 miles south-east of Tangiers. It is about  $\frac{1}{2}$  mile from the Mediterranean, is surrounded by walls and defended by a castle, and carries on an active trade. The environs of this city are planted with vineyards and gardens. Pop. about 20,000.

**TETZEL**, JOHANN, a notorious vender of indulgences, was born about 1470, at Leipzig, where he studied theology, and took the degree of B.D. in 1487. He entered in 1489 the order of the Dominicans, and received permission to go into the world and preach. In 1502 he was appointed by the Roman see a preacher of indulgences, and carried on for fifteen years a very lucrative trade in them, practising the most shameful delusions upon the people. His life was so corrupt that at Innsbruck he was sentenced to be drowned in a sack for adultery. In consequence of powerful intercession the sentence was mitigated to perpetual imprisonment. But being released also from this he travelled to Rome, was absolved by Pope Leo X., and even appointed apostolic commissary; and the Archbishop of Mainz made him inquisitor. He now carried on the sale of indulgences with still greater effrontery, and travelled through Saxony in a waggon, provided with two large boxes, one of which contained the letters of indulgence, while the other was destined for the money obtained for them. In many towns he was received with the ringing of bells, and everywhere levied large contributions, as he offered absolution for every crime, murder, perjury, adultery, not excepted. Luther came out in 1517 with his theses against this crying abuse. These were answered by Tetzel, and the students of Wittenberg burned the answers in the market-place. Tetzel himself received a severe reprimand from the Papal chamberlain who was sent to settle the dispute. He died of the plague in the Dominican convent at Leipzig in 1519. It is reported that Tetzel went so far as to

give absolutions for crimes yet to be committed. It is well known that a great part of the money thus received was used for the erection of St. Peter's church at Rome.

**TEUTOBURG FOREST**, the place where Arminius defeated the Roman general Quintilius Varus in the year 9 A.D. See **ARMINIUS**.

**TEUTONES**, a German tribe which, along with the Cimbri, invaded Gaul in B.C. 113, at the same time that the Cimbri, after defeating the Romans, passed through Gaul into Spain. The Teutones remained in Gaul, which they ravaged, along with the Ombrones. In B.C. 102 they were defeated in a great battle near Aquæ Sextiæ (Aix in the department of Bouches du Rhone) by Marius. The slaughter was prodigious. 100,000 are said to have been slain, and 80,000 to 90,000 taken prisoners. A tribe of the same name is mentioned by Pliny and others as inhabiting a district in the north-west of Germany to the north of the Elbe. This appears to have been the original settlement of the Teutones before their invasion of Gaul. It is questioned by some writers whether the Teutones were a German rather than a Celtic or Slavonian tribe. However this may be the terms Teuton and Teutonic are now applied to the whole German race.

**TEUTONIC KNIGHTS**, a religious order founded in 1190 by Frederick, duke of Suabia, during a crusade in the Holy Land, at the time of the siege of Acre, and intended to be confined to Germans of noble rank; hence its name. The rule of the order was similar to that of the Templars. The original object of the association was to defend the Christian religion against the infidels, and to take care of the sick in the Holy Land. The dress of the members was black, with a white cloak, upon which was worn a black cross with a silver edging. The grandmaster lived at first at Acre, but afterwards, when the Holy Land fell again under the power of the Turks, at Venice, and from 1309 at Marienburg in West Prussia. By degrees the order made several conquests, and acquired great riches. At the beginning of the fifteenth century it had reached the highest pitch of its power. Its territory extended from the Oder to the Gulf of Finland. But it afterwards gradually declined, in consequence of its luxury and dissensions. In the year 1229 the Teutonic knights were called in by the Poles to aid them against the Prussians, who also, after a war of fifty-three years, were forced to acknowledge the supremacy of the order, and to embrace the Christian religion. They also reduced the Slavonian countries along the Baltic, particularly after their union (1237) with the Brethren of the Sword in Livonia. The government of the order became so oppressive that West Prussia submitted in the fifteenth century to Poland, and the order was obliged to hold East Prussia under the supremacy of Poland. The endeavour to acquire independence brought on a war with Poland, the result of which was that the order lost also East Prussia, which in 1525 was granted to the grand-master, the margrave Albert of Brandenburg, as a hereditary duchy, under the sovereignty of Poland. Afterwards the head of the order from 1527 had his seat at Mergentheim, in Suabia, at present part of the Kingdom of Württemberg, and became a spiritual prince of the empire. By the Peace of Presburg (1805) the Emperor of Austria obtained the dignity, rights, and revenue of grand-master of the Teutonic order. In the war with Austria (1809) Napoleon abolished this order at Ratisbon, April 24. Its lands fell to the princes in whose territory they were situated. One of the archdukes of Austria bears the title Grand-master of the Teutonic order in the Empire of Austria.

**TEUTONIC LANGUAGES**. See **INDO-EUROPEAN LANGUAGES** and **PHILOLOGY**.

**TEWKESBURY**, a market town and municipal borough in England, in Gloucestershire, 11 miles north-east of Gloucester, and 104 miles N.W. of London. It is situated at the conflux of the Severn and Avon, in a beautiful vale, and is a handsome town consisting mostly of three principal streets. The houses are chiefly built of brick, but there are fine timbered houses dating from the fourteenth century. The parish church is a noble pile of building, in the Norman style, and one of the largest in England which is not collegiate or cathedral. It contains many interesting monuments, and is the only remains of the celebrated monastery of Tewkesbury, founded by the Saxons in 715. Other buildings are the grammar-school, town-hall, corn-exchange, hospital, &c. Near this town was fought, in 1471, a bloody battle between the parties of York and Lancaster, which put a final period to the power of the latter. It ceased to be a parliamentary borough in 1885. Pop. (1881), 5100; (1891), 5269; (1901), 5419.

**TEXAS**, one of the United States of North America, lat. 25° 50' to 36° 30' N.; lon. 93° 30' to 107° W.; bounded north by the Indian territories, north-west by New Mexico, south-west and south by the Mexican Republic, south-east by the Gulf of Mexico, and east by Louisiana and a small corner of Arkansas; length, east to west, 825 miles; breadth, 740 miles; area, 265,780 square miles. The surface in the north-west is covered with mountains, which, in proceeding south-east, subside into hills and undulating plateaus, succeeded, on approaching the Gulf of Mexico, by low alluvial plains. These extend inland from 20 to 80 miles, are furrowed with deep ravines, and except close to the coast form extensive prairies, or are covered with dense forests. The hilly region behind this consists chiefly of sandstone and limestone ridges, separated by valleys of considerable fertility, and presenting scenery of great beauty and grandeur, though few of the hills exceed 500 feet in height. In the mountainous region many of the summits are very lofty, and are covered with snow during the greater part of the year. Few countries are better watered than Texas, though few of the rivers are navigable by steam-vessels for more than 100 miles. The general slope of the country gives all the rivers a more or less southerly direction. Among these the most important is the Rio-Grande, which, proceeding from New Mexico, forms the west and south-west boundary of the state. Another important frontier stream is the Red River, which, rising in the north-west, within the frontiers of Mexico, forms the far greater part of the northern boundary. The other most important rivers are the Rio-Colorado, the principal central stream of the state; the Brazos; the San Jacinto and Trinity, and the Sabine, which, during the latter and greater part of its course, is the boundary between Texas and Louisiana. A long chain of lagoons, separated from the sea by a narrow belt of shore, stretches along the Gulf of Mexico. These lagoons, though encumbered at their entrance by bars, have great depth of water within. The soils of Texas include every possible variety; and taken as a whole, are extremely fertile. The two staple products are cotton and maize, both of which are largely cultivated on the coast, and for 100 miles up the principal rivers. In the same lower districts the sugar-cane and tobacco grow luxuriantly. The common cereals, wheat, rye, oats, and barley, thrive best in the hilly regions; and both there and at lower levels fruits in almost endless variety are abundant. The mulberry thrives well, and silk might be obtained

to an almost unlimited extent. The forests are extensive and magnificent. The pastures also are often covered with the richest natural grasses, and the rearing of cattle is carried on to the greatest advantage. The minerals are very valuable. There are extensive deposits of coal and lignite, abundance of iron ore, and tin, copper, and other metals are also found, besides salt, gypsum, building-stone, &c. Oil has recently been discovered and begun to be worked, and the Beaumont oil-field is said to promise a great future. Manufactures cannot yet be said to be extensively established, but they are making rapid advances, and Texas is in this respect ahead of any of the southern states. In the production of raw cotton it is now the first state in the Union. Immense quantities of cotton are sent to Britain and other countries from Galveston, the chief port of Texas. A magnificent system of railways exists. Austin is the capital. Dallas, San Antonio, Houston, Fort Worth, &c., are also important towns (besides Galveston). The first settlement in Texas was made at Matagorda by the French, who in 1690 were expelled by the Spaniards. It afterwards became one of the states of the Mexican Confederation. Several colonies of American citizens, invited by the Mexicans, settled in the eastern section, and, gradually increasing in numbers, Texas revolted from the federal government, and in 1836 its people declared themselves independent. Santa Anna attempted to reduce them, but failed. In 1845 the American settlers offered to make the whole country one of the United States. Congress accepted the offer, and thus gave rise to a war which proved disastrous to Mexico. Texas ranged herself on the Confederate side in the great civil war, and sent many men and great supplies into the field. Pop. in 1880, 1,591,749; in 1890, 2,235,523, of whom 494,333 were coloured; in 1900, 3,048,710.

TEXEL, an island belonging to Holland, about 14 miles in length and 6 in its greatest breadth. It is situated at the entrance of the Zuyder Zee, and separated from North Holland by the narrow channel of Mars-Diep. The island furnishes excellent pasture, and it is noted for cheese. It is well secured with dikes of prodigious strength and height. Near this island was the celebrated sea-fight between the fleet of Holland under Admiral Tromp and that of England under Admiral Blake, in 1653, in which Tromp was killed. In 1673 an indecisive battle was fought between the fleet of Holland and the united fleets of England and France. Pop. 7000.

TEZCUCO, a town of Mexico, in the department of Mexico, and about 16 miles E.N.E. of the city of that name, on the eastern shore of the Lake of Tezcuco. In ancient times it was the second city in the kingdom, and though still a place of some importance, now derives its chief interest from historical associations and remains of antiquity. There are here the massive remains of three vast pyramids, apparently *teocallis* or temples. (See *TEOCALLIS*.) The modern town contains many handsome edifices, has manufactures of woollen and cotton goods, and carries on an active trade chiefly with the city of Mexico. Pop. about 16,000.

THACKERAY, WILLIAM MAKEPEACE, English novelist and humorist, was born at Calcutta on July 18, 1811. His father, a member of an old Yorkshire family of good standing, was in the civil service of the East India Company. At the age of six, his father being now dead, Thackeray was sent to England for his education, and the voyage, during which he saw Napoleon in his island prison, was one of his earliest recollections. He was placed at the Charterhouse School, London, and afterwards studied at Trinity College, Cambridge. He left the

university without taking a degree; and having inherited from his father some £20,000, he found himself at liberty to follow the bent of his inclination, which pointed towards art and literature. After living some time in London he travelled in France and Germany, and was introduced to Goethe at Weimar. He entered the Middle Temple to study for the bar in 1831, but he soon gave up this profession (though called as a barrister in 1848), and in 1834 he settled at Paris to study art. He gradually became convinced, however, that art was not his vocation; and his fortune being much diminished—if not altogether dissipated—by losses and unlucky speculations, he resolutely set himself to fight his way in the profession of literature. He was at one time the Paris correspondent of the radical *Constitutionnel* (while holding this post he married, in 1836), and later (1837–38) he was connected with *The Times*. Under the names of George Fitz-Boodle, Esq., or of Michael Angelo Titmarsh, he contributed to *Fraser's Magazine* tales, criticisms, verses, &c., which were marked by great knowledge of the world, keen irony, or playful humour. It was in this magazine that *The Great Hoggarty Diamond* appeared, a story, like all Thackeray's, of a genuinely manly tone, and containing kindly satire and unaffected pathos; and also *Barry Lyndon*, in which the adventures of an Irish sharper and adventurer are detailed with great force and humour. In 1840 he published separately the *Paris Sketch-book*, in 1841 the *Second Funeral of Napoleon* and the *Chronicle of the Drum*, and in 1843 the *Irish Sketch-book*—the result of a tour in that island. None of these writings attained to any great popularity, though some sharp-eyed critics, among others John Sterling, had begun to prophesy the future eminence of their author. In 1841 *Punch* was started, and he contributed both by pen and pencil to that periodical, his *James's Diary* and *The Snob Papers* (*Book of Snobs*) being very successful. In 1847–48 his novel of *Vanity Fair* was published in monthly parts, with illustrations by himself; and long before its completion its author was unanimously placed in the first rank of British novelists. His next large work was the *History of Pendennis*, a novel containing a good many incidents from his own early life, completed in 1850. In 1851 he delivered a course of lectures in London on the English Humorists of the Eighteenth Century, repeated in Scotland and America before large audiences, and published in 1853. His next novel was the *History of Henry Esmond* (1852), which was followed by *The Newcomes* (1855), perhaps the most pleasing, as *Esmond* is the most finished, of all his fictions. His remaining novels are *The Virginians* (1859), *Lovel the Widower* (1860), and *The Adventures of Philip* (1862). Another, *Denis Duval*, was left unfinished at his death. In 1855–56 he delivered a series of lectures in the United States on *The Four Georges*, repeated in England and Scotland. In 1857 he offered himself as representative of the city of Oxford in the House of Commons, and was defeated by a small majority. In 1859 he became editor of the *Cornhill Magazine* (the first number of which bore the date of January, 1860), but he did not hold this post very long, as it demanded too much time and attention, and was not very congenial. His last three novels, together with a series of gossiping articles called *Round-about Papers*, came out in this magazine. On the morning of the 24th December, 1863, he was found dead in his bed, to the sorrow of all his friends, which is equivalent to saying of all who knew him, and to the regret of all lovers of English literature. Thackeray was one

of the most kind-hearted, manly, and honourable of men, ever ready to assist a friend, but the unsparing enemy of falsehood, meanness, and hypocrisy. His style is pure, quiet, flowing, idiomatic English. Besides the works mentioned he wrote *Notes of a Journey from Cornhill to Grand Cairo*, Mrs. Perkins' Ball, Our Street, Dr. Birch and his Young Friends, Rebecca and Rowena, The Kickleburys on the Rhine, &c. A library edition of his works, in 22 vols. 8vo, came out in 1867-69, others being the Standard (26 vols. 1883-85) and the Biographical (13 vols. 1898-99), the latter edited by his daughter, Mrs. Richmond Ritchie (see SUPP.). See Merivale and Marzials' Life (1879) and Mrs. Ritchie's Chapters from Some Memoirs (1894).

THALER, a silver coin of Germany, in value about 3s. See GERMANY, DOLLAR.

THALES, a native of Miletus in Ionia, or, according to some, of Phœnicia, the earliest philosopher of Greece, and the founder of the Ionian school, was born about 640 B.C. He is said to have made several visits to Egypt, where he calculated the heights of the pyramids, and received instructions from the priests. From them he probably acquired a knowledge of geometry, in which, however, his researches seem to have carried him beyond his teachers. After his return his reputation for learning and wisdom became so great that he was reckoned among the seven wise men, and his sayings were in the highest esteem among the ancients. To the Ionians he gave the wise counsel to form a general confederacy for the purpose of resisting the Persian power, and to make Teos the seat of the union. He also dissuaded the Milesians from entering into an alliance with Croesus against Cyrus. According to the most commonly received opinion he died about B.C. 548. His philosophical doctrines were taught orally, and preserved only by oral tradition, until some of the later Greek philosophers, particularly Aristotle, committed them to writing several hundred years after his death. He considered water, or rather fluidity, the element of all things, and that every natural object had its peculiar fluid principle, which contributed to its preservation. The philosophical doctrines of Thales are, however, but imperfectly understood, on account of the want of written memorials.

THALIA, one of the nine Muses. She was venerated by the country people as the preserver of growing plants and the inventress of agriculture and arboriculture. She was also the Muse of comedy, which had its origin in rural usages, and is usually represented with the comic mask and the shepherd's crook in her hand. One of the Graces was also called Thalia. (See GRACES.) The name signifies in the original Greek 'flourishing,' 'blooming.' (See MUSES.)

THALLIUM, a metal discovered by Crookes in 1861, in a deposit from the sulphuric acid manufactory of Tilkerode, in the Hartz. In preparing selenium from this deposit a residue was obtained, which, when examined in the spectroscopic, showed a bright green band. By further research it was proved that this band was due to the presence of a hitherto unobserved metal, to which the name of thallium was given, from the Greek *thallos*, a green twig.

Small quantities of thallium appear to be widely distributed in nature; the metal very frequently occurs in iron pyrites, in quantities varying from one part in 4000 to one part in 10,000 of the ore; it is also found in copper pyrites, in blende and calamine, in native sulphur, in the ores of bismuth, mercury, and antimony, in commercial selenium and tellurium, and in many other minerals; more especially in *crookesite*, a selenide of copper and silver from Sweden, which contains from 16.2 to 18.5 per cent of thallium. When thalliferous pyrites is burned by

the sulphuric acid manufacturer the thallium is oxidized, and condensed in the flue leading to the acid chambers. 'Flue-dust' is the source whence thallium is usually obtained. If the flues be very short the oxide of thallium is not condensed, but is carried into the chambers, where it is dissolved by the sulphuric acid; hence it is that this metal is frequently found in commercial oil of vitriol. Thallium may be prepared by boiling flue-dust with water acidulated with sulphuric acid, filtering, precipitating crude thallium chloride from the filtrate by the addition of hydrochloric acid, converting the chloride into neutral sulphate by treatment with sulphuric acid, and decomposing a solution of the sulphate by electricity.

Thallium is possessed of great metallic lustre; in colour it resembles silver, but it is less brilliantly white. Inasmuch as thallium becomes covered with a film of oxide whenever it is exposed to the air, the true colour of the metal can only be seen by scraping the surface of a mass of it under water, or by fusing the metal in hydrogen or coal gas. A globule of molten thallium, surrounded by an atmosphere devoid of oxygen, can scarcely be distinguished from liquid mercury. If a knife-edge be drawn along the surface of a mass of thallium exposed to the air the thin film of oxide is removed, but the metallic surface thus exposed instantly undergoes reoxidation, the light which falls upon it is decomposed by the film of oxide, and we notice a play of colours following the path of the knife-edge along the surface of the metal. The oxidation of thallium in air at the ordinary temperature does not proceed below the surface; when the metal is heated in air it melts, and is partly converted into an oxide. Thallium is softer than lead, it may be scratched by the finger-nail; it leaves a bluish-brown streak upon paper. The specific gravity of thallium varies from 11.8 to 11.9, according to the mechanical treatment to which it has been subjected. The tenacity of this metal is less than that of lead; it is possessed of very considerable malleability. The melting-point of thallium is about 280° C. When a fused mass is allowed to cool slowly the inner parts assume distinct crystalline forms, derived from the octahedron. Thallium and its salts impart an intense green colour to a non-luminous flame; when a flame so coloured is examined by the spectroscopic one very brilliant green band is noticed, somewhat more refrangible than the sodium line D. This band may be observed in the spectrum of a flame which contains but ~~rather~~ part of a grain of thallium sulphate. The salts of thallium are exceedingly poisonous. The symbol adopted for this metal is Tl, and the atomic weight 204.1.

THALLOPHYTES (Greek, *thallos*, a young shoot or frond, and *phyton*, a plant), the name of one of the primary divisions of the vegetable kingdom, comprehending those cryptogamous plants which are extremely simple in their structure, and possess nothing like the green leaves of phanerogamous plants. They comprise microscopic forms of the utmost simplicity, and also other forms, such as the larger sea-weeds and the cap-fungi, of considerable complexity, but all alike are purely cellular, without vessels or woody tissues, and without true stems, leaves, and roots. In regard to method of reproduction they show all stages of development, from those which propagate by simple fission to those which have a truly sexual distinction. Thallophytes include Alge, Characeæ, Fungi, and Lichens.

THAMES (Latin, *Tamesa*, *Tamēsis*, a name which is of unknown origin and signification), the most important, though not the largest river of Great Britain, is usually said to rise about 3 miles southwest of Cirencester in Gloucestershire, near a bridge over the Thames and Severn Canal, called Thames-

head Bridge, but is a small stream till it receives the Churn, Coln, and Leach, which take rise on the east side of the Cotswold Hills, and unite near Lechlade, where the counties of Gloucester, Wilts, Berks, and Oxford border on each other. Its direct course east by south to the Nore, where its estuary is considered to terminate in the German Ocean, is 124 miles; its indirect course to the same point is estimated at 250 miles. Proceeding from Lechlade, where it becomes navigable for barges, it flows first *E.N.E.*, then *S.S.E.*, past Oxford and Abingdon to Reading, then north-west past Great Marlow, and south-east past Windsor to Staines. In this part of its course it separates Berkshire on its right from Oxford and Buckingham on its left. From Staines it pursues a circuitous course eastward to London, passing the towns of Chertsey, Kingston, Richmond, and Brentford, and separating the counties of Middlesex and Surrey. Below London its course eastward to the Nore, between Kent and Essex, is 47 miles. Its principal affluents below Lechlade are, on the left, the Windrush, Evenlode, Cherwell which joins it immediately below Oxford, Thame (above this point it is often poetically called the Isis—a name of modern origin), Coln, Brent, Lea which joins it at Blackwall, Roding, Beam, and Ingrebourne; and on the right the Kennet which joins it immediately above Reading, Loddon, Wey, Mole, Wandie, Ravensbourne, Cray, and Darent. Thameshead Bridge is 376 feet above sea-level; at the junction of the Coln above Lechlade this height has diminished to 243 feet, showing on the whole distance of 22 miles an average fall per mile of 6 feet. Below this the average fall nowhere exceeds 2 feet 3 inches. At London Bridge, where the height above sea-level is 4 feet 3 inches, the average fall per mile is only 9 inches; from London Bridge to the Nore it does not exceed 1 inch. At London Bridge the width of the river is 266 yards, at Woolwich 490 yards, at Gravesend 800 yards, and 3 miles below, 1290 yards. The basin of the Thames has an area of 5400 square miles. It belongs entirely to the upper part of the secondary and to the tertiary formations, is destitute of coal, and hence possesses no manufactures of importance except those of the metropolis itself. It comprehends, however, some of the richest agricultural districts of the kingdom, and surpasses all others in point of wealth, derived partly from its containing the seat of government, and still more from its vast commercial importance. The depth of the river in the fair way above Greenwich to London Bridge is 12 to 13 feet, while its tides have a mean range of 17 feet and an extreme rise of 22 feet. Up to St. Katherine's Docks, adjoining the Tower, it is navigable by vessels of 800 tons, and to Blackwall by vessels of 1400 tons. As far as Deptford it safely floats vessels of any burden, though sand-banks beyond its estuary and at the Nore make the navigation rather intricate. At London and below the accommodation provided for shipping is of the most extensive and magnificent description. Nor has the navigation of its upper channel and the importance of navigable feeders been overlooked. By means of numerous canals, as the Thames and Severn, the Oxford, the Wilts and Berks, the Kennet and Avon, the Wey and Arun, the Basingstoke, and the Regent and Paddington, communicating with the Grand Junction, immediate access is given from its basin to those of all the great rivers of the kingdom. The river between Chelsea and London Bridge has of late years been much improved, and its flow regulated by the construction of 3 miles of embankment walls. The greatest was the Victoria Embankment on the north shore, which extends from Blackfriars to Westminster Bridges, a distance of about  $1\frac{1}{2}$  miles, where

the width of the river was abnormally great, and opposite Charing Cross Bridge has been reduced from 2400 to 2000 feet wide, and 37 acres reclaimed. On the Surrey side the river has been embanked for the greater part of the distance between Westminster and Vauxhall Bridges, for over  $\frac{2}{3}$  of a mile in length, and in this instance the river, which was abnormally narrow, for a short length has been widened. The river has been embanked on both sides between Chelsea and Battersea Bridges for nearly a mile, making it of nearly a uniform width of 700 feet. In consequence of the rise in high water of recent years the land abutting on the river in the metropolis has suffered much from flooding, and accordingly an act was passed in 1879 authorizing the Metropolitan Board of Works to remedy this evil. This has now been accomplished for the greater part of the frontage in the metropolis, extending over nearly 50 miles in length, by raising the wharf walls or forming dams, either movable or fixed, on the premises facing the river, so as to prevent overflow into the low-lying land in the rear, much of which is as much as 9 feet below the highest tides.

**THANE** (from the Anglo-Saxon *thegn*, *theygn*, a thane), the name of an ancient rank among the English or Anglo-Saxons. A freeman not noble was raised to the rank of a thane by acquiring a certain portion of land (five hides for a lesser thane), by making three voyages at sea, or by receiving holy orders. Every thane had the right of appearing and voting in the witenagemot, not only of his own shire but of the whole kingdom whenever any weighty matters of general interest were to be discussed, without, however, being bound to personal attendance, the absent being considered as tacitly assenting to the resolutions of those present. Offices, whether connected with the constant personal service of the king, or only during his residence in the thane's district, or with the administration of justice, were intrusted only to the thane, whose landed property was a guarantee for his conduct. The Anglo-Saxon thanes were in all respects the predecessors of the Norman barons, and in the time of Henry I. the titles seem to have been used synonymously.

**THANKT**, ISLE OF, a district of England, in the county of Kent, at the mouth of the Thames, separated from the mainland by the branches of the river Stour on the west and south. It extends about 9 miles east to west, and 5 north to south; area, 26,500 acres. It consists of rich and highly-cultivated fields. The towns are Margate, Ramsgate, and Broadstairs, all frequented for sea-bathing. It gives name to a parl. div. of Kent, with pop. in 1891, 60,646; in 1901, 71,518.

**THANN**, a town of Germany, in Alsace, on the Thur and on the railway from Strasburg to Basel, 23 miles S.W. of Colmar. It stands at the foot of a hill crowned by the ruins of the old castle of Engelburg, contains a magnificent Gothic church with a spire of open work 328 feet high, and has manufactures of cotton, woollen, and silk goods, machinery, colours, beer, and chemical products. Pop. (1895), 7537.

**THASO**, the ancient *Thasos*, the most northerly island in the *Ægean* Sea, a few miles south of the Macedonian coast. It is of a circular form, and about 16 miles in diameter. It is traversed by high wooded hills, which yield large quantities of ship-timber, and the highest summit of which attains an elevation of 3428 feet. The soil produces corn, fruit, oil, and wine; wax, honey, and fine marble are exported. It was at an early period taken possession of by the Phœnicians on account of its valuable gold-mines, which at one time yielded 300 talents annually, but which have long remained unworked.



The population, amounting to about 10,000, is scattered over a dozen villages, and the island is subject to an Egyptian governor.

**THEATINES**, a religious order of regular priests, founded in 1524 by St. Cajetan of Thiene and John Peter Caraffa, bishop of Chieti (anciently *Theate*), who was afterwards Pope Paul IV. They bound themselves, besides the usual monastic vows, to preach against heretics, to take charge of the cure of souls, to attend the sick and criminals, and to trust entirely to Providence, owning no property, and not even collecting alms, but expecting the voluntary gifts of the charitable. In Italy, and particularly in Naples, the order is numerous and influential; and the bishops are chiefly taken from their number. In Spain and Poland it also flourished considerably; but at present the order is mainly if not altogether confined to the provinces of Italy.

**THEATRE** (Greek, *theatron*), an edifice, generally of large dimensions, appropriated to the representation of dramatic spectacles. Among the Greeks and Romans the theatres were the chief public edifices next to the temples, and every town of importance had its theatre. In the infancy of dramatic art the plays, as well as the places in which they were exhibited, were equally rude. Thespis is said to have performed his plays upon a waggon, and previous to the time of Æschylus the Athenians had only a wooden platform, on which their dramas were performed. The first play which that great tragic poet brought upon the stage was performed on such a scaffold, and it is recorded as an ominous coincidence that on that occasion the structure gave way. To prevent the recurrence of such an accident a stone theatre was built on the south-eastern slope of the Acropolis. This building, called the Theatre of Dionysus (Bacchus), was, as we can yet see, of great size, and appears to have been constructed with considerable skill in regard to its acoustic and perspective arrangements. All the theatres in Greece, Asia Minor, and Sicily were, with some trifling modifications, probably built after the model of that of Athens. The site chosen was generally the slope of a hill, and the seats for the audience were in most cases cut out of the rock in rows rising above each other in arcs of concentric circles, each arc being about three-fourths of a circle. These rows of benches were divided at intervals into compartments by one or more broad passages parallel with the benches, and in which, when the house was well filled, many persons could find standing-room. Intersecting the rows of benches ran stairs leading from the lowest or front row to the highest or back row. The circular space immediately in front of the spectators was called the orchestra (from *orchēsthai*, to dance), and was the place on which the chorus performed its evolutions and dances, and which was therefore floored with boards. In the centre of the orchestra stood the *thumēle*, or altar of Dionysus, upon a raised platform, which was sometimes occupied by the leader of the chorus, the flute-player, the prompter, &c. The stage was behind the orchestra, that is farther from the spectators, on a somewhat higher level, and the chorus probably ascended to it by steps when it had to take a part in the real action of the drama. The back of the stage was closed by a wall, with several doors in it, called the *skēnē* (Latin, *scena*). The space between the scena and the orchestra was termed the *proskēnion* (*proscenium*), and this was the place where the actors regularly stood when they spoke; but in regard to some details of the ancient theatres different views are held. There was no scenery in the modern sense of the word, but the scena was decorated so as to present as far as pos-

sible the locality in which the action was supposed to be going on. The stage appears to have been fitted with machinery for raising the supposed shades from the lower world and for elevating the gods and heroes into the upper regions. No part of the theatre was roofed in, and in case of a heavy rain the spectators had to take shelter in the porticoes running round the building. Awnings were sometimes used to protect them from the heat of the sun, for the performances always took place by daylight. The most serious defects of the Greek theatres were that that portion of the audience which was seated at the extreme ends of the rows of benches must have sat sideways to the stage, with part of it behind them. The vast size of the buildings, too, intended as they were to accommodate all the citizens at one sitting, rendered it impossible for the unaided human voice to reach all parts of the house, and only a very few of those nearest the stage would have been able to perceive the expression of the actors' faces. These drawbacks did not, however, appear to the Greeks so serious as they would do to us with our totally different conceptions of dramatic acting. The ancient actors wore masks provided with metallic mouth-pieces, which served the purpose of a speaking-trumpet; and as they must have appeared like pigmies as seen from the remoter parts of the building, they wore thick-soled shoes (*buskings*), and padded their bodies to give themselves a more imposing appearance. As in the earlier days of the modern theatre, the actors were invariably males. Women indeed were forbidden to enter the theatres as spectators, except during the performance of tragedies. The performances began early in the morning, and consisted of two or three connected dramas, ending with a satirical or humorous comedy or farce, and lasted ten or twelve hours. The places in the front rows of the benches were reserved for the dignitaries of the state or city, the priests, and foreign ambassadors. The better places in the remaining rows fetched higher prices than those remoter from the stage; but from the time of Pericles the poorer classes, and subsequently all the citizens, were admitted at the cost of the public treasury. The Romans, like the Greeks, had for a long time only wooden scaffolds for their scenic representations. These stages were erected when necessary, and pulled down at the close of the performances, and it was upon such temporary scaffolds that the plays of Plautus and Terence were first performed. In 55 B.C. Pompey erected the first stone theatre in Rome, the remains of which still exist in the Palace Orsini. It was built near the Campus Martius after the plan of the theatre of Mitylene, and could accommodate 40,000 spectators. The seats for the audience in the Roman theatres formed a semicircle, as did the orchestra, the diameter of which formed the front line of the stage. (The Greek auditorium, as already stated, formed about three-fourths of a circle.) The orchestra, instead of being appropriated to the chorus, was occupied by the senators, foreign ambassadors, and other distinguished personages. Women performed in interludes and mimes, but never in the regular drama.

Between the decline of the ancient and the rise of the modern drama there is a long interval, in which the nearest approach to theatrical entertainments is found in miracle-plays, mysteries, and interludes. These performances took place in churches, convents, and colleges when superintended by churchmen, or in halls temporarily fitted up for the occasion when got up for the amusement of princes and nobles. In 1548 the confraternity of the trinity opened a theatre in Paris, in which they performed, in terms of their license, only secular pieces of a lawful and honest character. So late as 1561 the

French had no scenery, and the whole of the players remained on the stage from the beginning to the end of the performance. The first theatre erected in Italy seems to have been that of Florence, built in 1581 by Bernardo Buontalenti, but it does not appear to have been a public one, and could not have been very spacious, as it now forms a salon in Uffizi Gallery. A year or so later a theatre (the Teatro Olimpico) was built at Vicenza by Palladio on the ancient models, but considerably reduced in size. The first building that approaches the modern style was that constructed by Aleotti at Parma in 1618. The narrowed stage permitted the use of painted scenes, and its increased depth allowed the introduction of complicated machinery and the performance of spectacular pieces. In England there were organized companies of actors as far back as the time of Edward IV., but as there were no regular playhouses the performances took place in tennis-courts, yards of inns, and private houses. The London Theatre was built before 1576, and the Curtain in Shoreditch and the playhouses in Blackfriars and Whitefriars date from about the same time. Shakspeare's plays were brought out at the house in Blackfriars and at the Globe on the Bankside, both of which belonged to the same company, to whom James I. granted a patent in 1603, and who thence became known as the king's servants or players. The Globe was a six-sided wooden structure, partly open at the top and partly thatched. The centre formed probably an uncovered court, where the common people stood, and round three sides ran galleries or scaffolds, under the lowest of which were inclosed boxes called lords' rooms. To the seatless pit the groundlings had access for 1*d.* or 2*d.*; the admission to the galleries was 6*d.*, and to the lords' rooms 1*s.* The fast gentlemen of the day could show off their dress, their persons, or their wit upon the stage itself by paying an additional fee for a stool. Here they could be supplied with refreshments and pipes by their pages. This eating, imbibing, and smoking soon extended to the other parts of the house. The upper gallery was at one time free to the livery servants of the ladies and gentlemen attending the performances; but the occupants became so unruly and offensively critical in their remarks that this privilege was taken from them and the gallery thrown open to a paying public. The old theatres commenced their performances at one o'clock, which hour was subsequently altered to two, and later to three o'clock. Movable scenery was first used on the public stage by Davenant in 1662, and about the same time this manager introduced women to play female characters, hitherto taken by boys and men.

Modern theatres are all very much alike in their internal construction. The house is divided into two distinct portions, the auditorium and the stage. The ground-floor of the auditorium is always sloped down from the back of the house to the stage; several tiers of galleries run in a semicircular or horse-shoe form round the house. On the ground-floor the front rows of seats are generally reserved as dress or orchestral stalls, and the back part is called the pit. In playhouses the seats in the galleries rise terrace-wise from the front, so as to allow the persons in the back rows to see on to the stage over the heads of those before them; in opera-houses the floors of the galleries are generally level, and the space divided into private boxes, with the exception of the upper tier, which is sloped and has unbroken rows of seats. In all the large and completely fitted up opera-houses there are retiring rooms connected with the boxes, and one or more crush-rooms (French, *foyers*), where the audience can promenade in the intervals between

the acts. Immediately in front of the stage is a space (which may be enlarged or contracted when necessary) occupied by the orchestra. The part of the stage in front of the curtain is called the proscenium, and the parts of the house on both sides of this, together with the ceiling and fronts of the tiers of galleries, are generally the best ornamented portions of the house. But it is the stage, with its multifarious contrivances and complex mechanism, its scenery and pictorial effects, and its great length from front to back, which forms the most striking difference between the theatres of modern and ancient times. The floor of the stage has an upward incline from front to back of about half an inch to every foot. Part of the flooring is movable, either as traps through which actors or furniture ascend and descend, or in long narrow pieces which are drawn off at each side of the stage to allow the passage of the rising scenes. Some of the scenes are painted on sheets of canvas which occupy the full opening of the stage, and which are raised and lowered on rollers above the stage; the wooden scenes or flats are pushed in grooves from each side to the centre, each flat forming half a scene. The wings are narrow scenes pushed out from the sides to screen the entrances; the borders are similar narrow scenes lowered a little from above, which serve to hide the gas-battens. Adjoining the stage are the dressing-rooms for the performers; the green-room, in which they wait after having dressed till called upon to go on the stage; the manager's room; star-rooms, or dressing-rooms for the more celebrated actors engaged for short periods from time to time during the season; the wardrobe, in which the dresses are kept; furniture stores, property stores, workshops for the carpenter, gas-man, &c.; scene-painters' room; the prompter's box, which must be placed in such a position that the prompter can command a view of the whole stage. It is this official's duty to refresh the player's memory when at fault, to see that each performer called to steps on the stage at the proper moment, to raise or lower the lights, which he is enabled to do by a series of handles placed in his box beside him, and so on. The side of the stage on which this little room is located is called the prompt-side, and the other the O.P. or opposite side. The stage is lighted from the sides by upright rows of lights, from the top by horizontal rows, while along the front, and only raised a little above the level of the flooring, run the foot-lights. See *Doran's Their Majesties' Servants* (new edition, 1888); *Baker's The London Stage* (1889); *Genest's Account of the English Stage* (1832); *Fleay's Chronicle History of the London Stage* (1890); *Sachs and Woodrow's Modern Opera-Houses and Theatres* (2 vols., 1896-97); &c.

**THEATRES, LAWS RELATING TO.** The English act for regulating theatres is the 6 and 7 Vict. cap. lxxviii., which provides that no person shall keep open any house for the public performance of stage-plays without the authority of letters-patent or a license from the lord-chamberlain or the justices of the peace, under the penalty of a sum not exceeding £20 for every day such house shall have been kept open without a license. The lord-chamberlain may grant licenses to theatres (not being patent theatres) within the boundaries of the English metropolis, also within New Windsor and Brighton, and wherever his majesty may occasionally reside; but no license can be granted within Oxford or Cambridge, or within 14 miles of the same, without the consent of the chancellors or vice-chancellors. For every license a fee is to be paid to the lord-chamberlain, to be fixed by himself, according to a scale, but not to exceed 10*s.* for each calendar month during which the theatre is licensed to remain open. The licensing



power of the justices of the peace was transferred to the county councils by the Local Government Act of 1888. The license in all cases is only to be granted to the actual and responsible manager, whose name and place of abode shall be printed on every play-bill issued by him, and who shall become bound, himself in a sum not exceeding £500, with two sureties for sums not exceeding £100 each, for due observance of the rules. The lord-chamberlain and the councils within their respective bounds may suspend any license in cases of riot or misbehaviour, or order the theatres to be closed on any public occasion. Any theatre opened in contravention of such orders will be deemed an unlicensed theatre, and the manager will be subject to the penalties incurred. Persons performing for hire in any unlicensed theatre, or causing, permitting, or suffering to be acted any part in any stage-play, to forfeit, at the discretion of the councils, a sum not exceeding £5 for every day on which they offend. No new play or additions to old ones, no new or altered prologue or epilogue, to be acted or recited till copies have been deposited with the lord-chamberlain seven days at least before the intended representation. The lord-chamberlain or his deputy may object to the whole or any part of such play, prologue, or epilogue, and upon such disallowance, or before the expiration of seven days, if any person shall represent, or cause to be represented, such play, &c., he shall become liable to a penalty, affixed by the justices before whom he is convicted, of any sum not exceeding £50 for each offence, and the license, in case of there being such, becomes void. The word *stage-play* is declared to include all theatrical entertainments, but the act is not to apply to shows exhibiting at any lawful fair allowed by the magistrates.

THEBES (Egyptian, *Waset* or *Net*; Hebrew, *No* or *No-Ammon*; Greek, *Thēbai* or *Dionopolis hē Megalē*), a celebrated city of ancient Egypt, now represented by some magnificent ruins on the banks of the Nile, about 350 miles in a direct line S.E. of Cairo. Its site is a fertile strip of land on both banks, flanked by limestone hills, which approach nearer the river on the west than on the east. The ruins comprise temples at Karnak and Luxor on the right bank, on and near the site of the ancient city proper, and temples on the level strip on the left bank with tombs hewn in the rock, representing the necropolis of the old capital. The greatest of the temples is the Temple of Ammon, at Karnak, the largest building in the world, begun about 2200 B.C. and extended under many subsequent kings, notably those of the great nineteenth dynasty. Its total length, from north-west to south-east, is about 1200 feet, and its greatest breadth about 350 feet. The huge pylon on the north-west gives admittance to the great square court, built in the eighth century, with an area of fully 2 square miles, containing ten huge columns in two rows in the centre, a temple of Sethos II. in the north angle, and a fine temple (exhumed 1896-97) of Rameses III. in the south wall. Through a second pylon of great size we pass into the celebrated hypostyle hall, built by Sethos I. and Rameses II. It is 338 feet broad by 170 feet long, with an area of 5450 square yards. The central aisle or nave, 78 feet high, has its roof supported by two rows of six pillars, each 33 feet in circumference, and the two side aisles, 46 feet high, have each their roofs resting on sixty-one columns in seven rows, each column being 27½ feet in circumference. All these columns and also the walls of the hall are covered with reliefs and inscriptions, and on the outside of the north and south walls there are reliefs commemorating victories of Sethos I. and Rameses II. respectively. The other ancient

buildings and objects of interest at Karnak include the Temple of Mont (a war-god), originally built by Amenophis III.; the Sacred Lake, beside the Great Temple; the Temple of Mut (wife of Ammon), now very much ruined, with a curved sacred lake, built by Amenophis III., and connected with the Great Temple by an avenue of sphinxes and the ruins of other buildings; and the Temple of Khons (son of Ammon), built by Rameses III. and later kings. Luxor contains fine remains of a temple built by Amenophis III. and later kings to Ammon, Mut, and Khons, and formerly connected with Karnak by a paved street. Of the numerous remains on the west bank of the river the principal are the following:—The Temple of Sethos I., at Kurna, dedicated to Ammon; the Tombs of the Kings, consisting of passages and chambers hewn in the rock, the most noteworthy being perhaps those of Rameses IV., Rameses IX., Rameses VI., and especially Rameses III., and Sethos I.; the Tombs of the Queens; the Ramesseum, a temple to Ammon built by Rameses II., containing a huge Colossus of Rameses II.; the Colossi of Memnon, two statues of Amenophis III., 64 feet in height, the northern one being the celebrated vocal statue (see MEMNON); the Temple of Dér el-Bahri (exhumed in 1894-95), dedicated to Ammon, built by Queen Makerē, sister of Thutmosis III., with an unusual plan; the Tombs of Shēkh Abd el-Kurna, those of high officials under the eighteenth dynasty; the beautiful but small Temple of Dér el-Medīneh, founded by Ptolemy IV. and later kings, and dedicated to Hathor and Maat; and the castle-like Pavilion of Rameses III. in front of the large temple of Rameses III. in Medinet Habu, where also is a fine small temple built by Queen Makerē and Thutmosis III.

Thebes first became of importance under the eleventh dynasty, when its princes became rulers of all Egypt, and the expulsion of the invading Hyksos kings was ultimately effected by the Theban rulers. From that time the city continually grew in splendour, and became filled with the accumulated treasures of warlike rulers. The Temple of Ammon was gradually built to its gigantic proportions, and its priests became exceedingly wealthy and powerful. Amenophis IV. attempted to replace the worship of Ammon by sun-worship, and made Tell el-Amarna his capital, but the 'hundred-gated city', as it is called in the *Iliad*, rapidly revived under his successors. Ultimately Herihor, a high-priest of the Temple of Ammon, succeeded the last of the Ramesides on the Egyptian throne. With the accession of the Tanite (twenty-first) dynasty Thebes ceased to be the capital, and its decline was thenceforward practically constant. It was plundered by the Assyrians in the seventh century B.C., and at later periods it was the centre of revolts against foreign rulers. It is now represented by a few villages.

THEBES (Greek, *Thēbai*), the principal city of Boeotia, and one of the most celebrated cities of Greece, the birthplace of Pindar, Epaminondas, and Pelopidas. It was situated on an elevated level, on which were the sources of the Dirce and Ismenus. Cadmus, leading thither a Phœnician colony, is said to have founded the city by building the citadel called Cadmeia (B.C. 1500). The principal name in the legendary history of Thebes is that of Œdipus. (See ŒDIPUS, also ETROCLUS and POLYNICES.) The first historical event in its history took place in 728 B.C., when Philolaus drew up a code of laws for the Thebans. During the Persian wars it lost much of its influence in Greece through its perfidious leagues with the Persians. In the Peloponnesian war the Thebans rendered important services to the Spartans; but they afterwards, through jealousy of the Spartan

power, joined the confederacy against them in 394. In 382, though peace then prevailed, Phœbidas, the Spartan commander, treacherously possessed himself of the Cadmeia, which was held by the Spartans until Pelopidas and Epaminondas headed a conspiracy which resulted in the death of the tyrants (B.C. 378). Open war now broke out between Sparta and Thebes, which resulted in the humiliation of the former by the crushing defeat of Leuctra (371). Thebes, under the brilliant leadership of Epaminondas and Pelopidas was now the leading state in Greece, but its supremacy departed when the former fell at the battle of Mantinea (B.C. 362). On the rise of the Macedonian power Thebes entered into an alliance with the Athenians and other Greeks against Philip. After the battle of Chæronea (338 B.C.) it was obliged to receive a Macedonian garrison. On Philip's death an insurrection broke out in Thebes, and an attempt was made to drive the Macedonians from the Cadmeia. But Alexander hastened to their relief, captured and destroyed (B.C. 336) the city, and reduced the inhabitants to slavery. Twenty years afterwards Cassander rebuilt Thebes; but it never recovered its former importance. In the war of the Romans against Mithridates, king of Pontus, it joined the latter out of gratitude to Athens, and was severely chastised by the Romans. From this time the Thebans disappear more and more from history. In its most flourishing period Thebes was a very populous city. The city was, in a certain degree, the head of Boeotia, and was the leading power in a confederacy composed of several Boeotian cities. The modern town of Thebes or Thiva is an unimportant town of some 3500 inhabitants.

**THEFT.** See LARCENY.

**THEINE**, an alkaloid contained in tea and in coffee. For a description of the properties of this substance see the articles **CAFFEINE** and **TEA**.

**THEISM.** See **DEISM**.

**THEISS**, or **TISZA** (Latin, *Tisza* or *Tysia*), a river of Hungary, which is formed in the east of the kingdom, by the junction of the Black and the White Theiss, both descending from the Carpathians. It first flows in a north-westerly direction, then bends to the south-west, and lastly flows almost due south, but with innumerable windings, till it reaches the left bank of the Danube, about 20 miles above Belgrade. In point of magnitude it is the second river in Hungary, being inferior only to the Danube, with which, for about 100 miles, the lower part of its course is almost parallel. Its direct course south-west is only 280 miles, but so numerous are its windings that its indirect course exceeds 800 miles. Its principal tributary is the Maros from the east. The Theiss passes Tokay, Szolnok, Szegedin, &c. On the 12th of March, 1879, there took place a terrible inundation of the Theiss, which laid the whole town of Szegedin under water, causing the death of many hundreds of persons, and rendering from 80,000 to 100,000 people homeless.

**THELLUSSON**, **PETER**, a wealthy London merchant, the singular terms of whose will gave occasion to the passing of an act of Parliament known as the Thellusson Act. He died in 1797, leaving to his widow and family about £100,000, and the remainder, amounting to more than £600,000, he left to trustees, to accumulate during the lives of his three sons, and the lives of their sons; then the estates directed to be purchased with the produce of the accumulating fund, to be conveyed to the eldest male descendant of his three sons, with benefit of survivorship. This will, being contested by the heirs at law, was finally established by a decision of the House of Lords, June 25, 1805. An act of Parliament, however, was soon after passed (39th

and 40th George III. cap. xcvi.), restraining the power of devising property, for the purpose of accumulation, to twenty-one years after the death of the testator. Thellusson's last surviving grandson died in 1856, and the final disposal of the property was not settled without an expensive and protracted lawsuit.

**THEME**, in music, is the subject or leading melody in a composition; in a fugue it is successively repeated or imitated in the same or in a different key by the various parts. Originally simple, themes are frequently more or less disguised by groups of ornamental notes, called variations, which serve too often merely to show off the performer's flexibility of voice or nimbleness of fingers.

**THEMIS**, goddess of order among the Greeks, was the daughter of Uranus and Gæ (Heaven and Earth); according to some, of Helios, or the Sun. She became by Zeus the mother of the Hours and the Fates (Moiræ); and her daughter Dikê, the goddess of justice, is often confounded with her.

**THEMISTOCLES**, a celebrated commander, was born at Athens in B.C. 514. He early gave evidence of great abilities, combined with great ambition. In 483 B.C. Aristides was ostracized partly through the influence of his rival Themistocles, who now became the political leader in Athens, and was in 481 elected Archon Eponymus. On the second invasion of Greece by Xerxes, Themistocles succeeded by bribery in obtaining the command of the Athenian fleet, which mainly owed its existence to the advice he gave the Athenians to employ the produce of the silver mines of Laurium in building ships. For he was far-seeing enough to know that the Athenians could do most damage to their enemies at sea. His advice to occupy the pass of Thermopylae was neglected, and Boeotia was soon entirely overrun by the Persians, who immediately began to advance upon Athens. Themistocles now proposed that the Athenians should convey their women and children to places of security, abandon their city to the Persians, and that all who were capable of bearing arms should take to their ships. This proposition was acceded to, and all the exiles, among whom was Aristides, were recalled. The command of the allied Greek fleet, although consisting mainly of Athenian ships, was intrusted to Eurymedon, a Spartan. In the battle of Salamis, which followed (B.C. 480), the Persian fleet was almost totally destroyed, and Greece was saved. The chief glory of this victory is due to Themistocles, who, before and during the battle, displayed not less valour than prudence and genius for command. After the retreat of the Persians, on the rebuilding of Athens, it was by the advice of Themistocles that the city walls were rebuilt, and made stronger than before, and it was by his influence also that the Piræus, the principal port of Athens, was constructed, and connected with the city by the Long Walls. After this time the influence of Themistocles declined. He is accused of having enriched himself by unjust means, and there is little doubt that the Athenians clearly perceived the unscrupulousness of his character. He was ostracized in B.C. 471, and retired to Argos. While here he was accused by the Spartans of being privy to the design of Pausanias to betray Greece to the Persians, and dreading that the vengeance of his countrymen would reach him at Argos, he fled to Corcyra, to the inhabitants of which he had rendered important services. Not feeling secure here, he withdrew to Epirus, and afterwards sought and obtained the protection of Admetus, king of the Molossians. But Athenian and Lacedæmonian agents followed him here, and he finally took refuge at the Persian court. Xerxes was now dead (465 B.C.), and the throne was occupied by Artaxerxes Longimanus.

Themistocles procured access to Artaxerxes, and received himself the 200 talents which that monarch had offered for his head, with the promise of greater rewards in case he would give information concerning the state of Greece. He asked for time to learn the Persian language, and in the space of a year he was able to appear at the royal court like a native. His address and talents gained him the favour of Artaxerxes, and he was treated with the greatest distinction. He died in 449, according to some accounts having taken poison, knowing that he could not fulfil his promises to the king. Twenty-one spurious letters are ascribed to him.

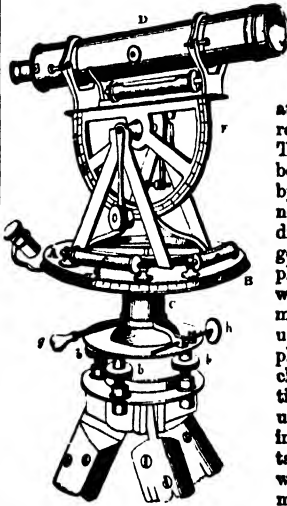
**THEOCRACY** (from Gr. *Theos*, God, and *kratos*, power) is that government of which the chief is, or is believed to be, God himself, and the laws the commandments of God. The priests in such a government are the promulgators and expounders of the divine commands, the representatives of the invisible Ruler, who, however, can also call other persons to this dignity. The most notable theocratic government of all times is that established by Moses among the Israelites.

**THEOCRITUS**, the chief of pastoral poets, was born at Syracuse, according to others at Cos, and flourished about B.C. 280. Having gone to Egypt he was treated with much distinction by Ptolemy Lagus and Ptolemy Philadelphus, but afterwards returned to Syracuse, where he appears to have been on terms of some intimacy with Hiero II. We have under his name thirty idyls, or pastoral poems, of which, however, several are probably by other authors. He is to be considered the creator of this species of poetry as a branch of Greek literature, though the elements of it existed before his time among the Dorians both of Sicily and Greece. Most of his idyls have a dramatic form, and consist of the alternate responses of musical shepherds. They present fresh and vivid pictures of common life in Sicily, and are marked by considerable comic, and, though to a less extent, tragic power. Writing in a mixed Doric dialect, which is peculiarly adapted to the simplicity of rural life, his language is strong and harmonious. His metre is chiefly the heroic hexameter. Besides the idyls he wrote a poem called *Berenice*, of which only five lines and a word are extant, and twenty-two epigrams in the Greek Anthology. The best editions of his works (which are usually joined with those of Moschus and Bion) are those of Meineke (1856); Paley (1863); Wordsworth (new edn., 1877); and Fritzsche (3rd edn., by Hiller, 1881). A good English verse translation is that of C. S. Calverley, and there is a prose one by Andrew Lang.

**THEODOLITE**, a most important surveying instrument, used for measuring angles in azimuth and altitude, and sometimes for levelling, ranging lines, &c. There are different forms of theodolite; that represented in the figure is called a Y theodolite, from the shape of the rests in which the telescope D is free to rotate. A transit theodolite is constructed so that the telescope may be rotated clean round on the axis of the vertical limb, which in its case is rigidly connected to the telescope, and cuts the telescope axis at right angles, and is fitted with a lamp to throw light against the cross-wires, as in the case of a regular transit instrument. (See **TRANSIT INSTRUMENT**.) D is an ordinary refracting telescope, having in the principal focus of its object-glass an arrangement of fibres of unspun silk called cross-wires. One of these fibres is level when the instrument is correctly set up, and two others, like the letter X, intersect at a point in the first. The point of intersection of the cross-wires, and the point called the optical centre of the object-glass, determine the

*line of collimation*. This line need not absolutely coincide with the axis of the telescope tube or the axis of the rings which rest in the Y's, but it must be at least parallel to the line joining the centres of these rings. When a point is to be viewed with the telescope the telescope is moved so that the image of the point coincides with the intersection of the cross-wires—that is, the point is on the line of collimation, and it may be seen that the measuring arrangements of the instrument are all for the purpose of measuring the angles between different positions of this line. The vertical limb F is divided into degrees, and is capable of being read by means of a vernier and the microscope seen in the figure to thirds of a minute. A pair of plates, A and B, constituting at their edge the horizontal limb of the instrument, are free, when unclamped, to move independently of each other. The upper of these carries a magnetic compass and two spirit-levels c c. From it also rise the standards which support the telescope. At opposite ends of a diameter a a this upper plate

is graduated to form verniers, which enable readings to be taken in azimuth to thirds of a minute; a microscope, shown at A, is furnished to read the vernier. These two plates can be clamped together by a clamping screw, not shown in the drawing, and a tangent screw is also supplied, by means of which a small motion may be given to the upper plate after the plates have been clamped. c is the vertical axis. The whole upper portion of the instrument may rotate about c, except when c is clamped by means of the screw g; A is a tangent screw,



by which a small motion in azimuth may be given after the screw g has been tightened. The plates seen below c are called the parallel plates; they are connected by a ball-and-socket joint in continuation of the vertical axis, and by means of the screws b b b, called parallel-plate screws, the vertical axis is set truly vertical, as indicated when the spirit-levels c c have their bubbles at the centres of their tubes. The various adjustments of the theodolite are described at length in special treatises. (See *Simms on Mathematical Instruments*.) To range a straight line with the theodolite the instrument is set up over a point on the line by means of a small plumb hanging from a hook at the centre of the lower parallel plate, the vertical axis is set truly vertical by means of the parallel-plate screws, the telescope is turned into the plane of the proposed line, and then clamped in azimuth; pegs placed in the undulating ground, as directed by moving the telescope in altitude, will be all in this vertical plane, when they are said to be in straight range. It is manifest that if the reading on either vernier be taken, and the clamping between the two plates of the horizontal limb be undone, and if the telescope be turned in azimuth into some other vertical plane, the difference between a second reading of the vernier and the first reading will give the angle between these planes.

**THEODORE**, Bishop of Mopsuestia, one of the most distinguished ecclesiastical authors of his age, was born at Antioch, about the middle of the fourth century. He studied rhetoric under Libanius, philosophy under Andragathus, and sacred literature under Flavianus of Antioch, Diodorus of Tarsus, and others. Early in life he followed the example of his fellow-student and intimate friend John Chrysostom in embracing the monastic life, when he was on the point of marrying a lady of Antioch named Hermione. He was ordained priest, and for fifty years distinguished himself as a zealous opponent of the heresies of Arius, Apollinarius, and others. From Antioch he removed to Tarsus, and in the year 392 or 394 he was chosen Bishop of Mopsuestia in Cilicia. In 394 he preached before the Emperor Theodosius at Constantinople, and was present at the council held in that city at that date. He died about 429, after having filled the office of bishop for thirty-six years. He was a voluminous writer, if we can judge by contemporary accounts, and by the number of books, only a few fragments of which are extant. The most important of his works are commentaries on almost all the books of the Bible, and various polemical treatises. They were held in great repute among the Syrian churches, and many of them were translated into Syriac, Arabic, and Persian. A zealous heresy-hunter himself in his lifetime, his orthodoxy was questioned after his death by Cyril of Alexandria, and he and his writings were condemned at the oecumenical council of Constantinople in 553. His doctrine approximated somewhat to that of Pelagius. Nestorius was said to have been his disciple, and the followers of the latter often appealed to Theodore's works.

**THEODORET**, a distinguished ecclesiastical historian and theological writer, was born at Antioch about the close of the fourth century (the dates 386 and 393 are both given). At a very early age he was sent for education to a monastery near Antioch, where he had Nestorius and John of Antioch for fellow-pupils. After twenty-five years' close study and retirement in the monastery he quitted it in 420 or 423, to succeed Isidorus as bishop of Cyrus or Cyrrhus, a small and poor city about two days' journey from Antioch. Here, in the performance of his clerical duties and in the composition of his exegetical and other works, he might have passed a peaceful life; but in that age it was impossible for a man of any mark to remain neutral in the internecine war of the religious parties. He endeavoured to play the part of an impartial mediator between his old fellow-student Nestorius and Cyril of Alexandria, but could effect no reconciliation. In 431 Nestorius was deposed by the Council of Ephesus, an act which Theodoret at first strongly protested against, but which he was eventually induced to excuse. When it became evident, however, that the Nestorians were to be prosecuted with relentless severity, he threw aside all pretence of peace, and stood forth as the decided champion of Nestorius against the overbearing and intolerant Cyril and his successor Dioscorus. The latter plainly accused Theodoret of Nestorianism, pronounced a public anathema upon him in the church of Alexandria, and in 449 procured his deposition at the so-called robber council of Ephesus, a sentence which was reversed by the general council of Chalcedon in 451. Theodoret appears to have died in 457 or 458. The most important of his works, of which an excellent edition was published by Schulze and Nösel (Halle, 1769-74, five vols. 8vo), consist of commentaries on numerous books of the Old Testament and on the Pauline epistles; Ecclesiastical History in five books, a valuable work on account of its learning and general impartiality,

beginning with the history of Arianism under Constantine the Great, and ending with the death of Theodore of Mopsuestia; Religious History, a narrative of the lives of the celebrated thirty hermits called the Fathers of the Desert; *Eranistês*, three dialogues against the Eutychians; a Concise History of Heresies, in the composition of which his tolerant spirit seems to have deserted him; various Orations, Homilies, and minor treatises; and a collection of letters, which throw much light on the history of the time.

**THEODORIC**, King of the Ostrogoths, was born in A.D. 455. His father, Theodemir, was one of the three brothers who jointly ruled the Ostrogoths settled in Pannonia; and he sent him, when only eight years of age, to Constantinople as a hostage, to secure the conditions of a treaty between the Goths and the Emperor Leo. After residing ten years with that emperor he was restored to his father, then sole monarch of the Ostrogoths. On the death of Theodemir, in 475, he succeeded to the crown, and commenced a course which, after menacing the safety of the Greek Empire, and Constantinople itself, terminated in an expedition against Odoacer, who had assumed the title of King of Italy. After several bloody engagements the latter was finally induced to yield, on condition that he and Theodoric should govern Italy with equal authority (493). The murder of Odoacer at a banquet soon followed this agreement; on which Theodoric caused himself to be proclaimed King of Italy—a title that the Emperor Anastasius was reluctantly obliged to sanction. However indefensibly he acquired dominion, he governed with extraordinary vigour and ability. He attached his soldiers by assigning them a third part of the lands of Italy, on the tenure of military service; while among his Italian subjects he encouraged industry and the arts of peace. He even improved the administration of justice, and, though a Goth, was so far from delighting in the destruction of public monuments, that he issued edicts to protect them at Rome and elsewhere, and assigned revenues for the repair of the public edifices. Like his ancestors he was an Arian, but was indifferent to controversy, and never violated the peace or privileges of the Catholic Church. The particulars of the government of this memorable prince, who shed a short-lived lustre on the Gothic name, are recorded in twelve books by his secretary, the senator Cassiodorus, a man of learning, who induced his illiterate master to become a patron of letters. It is to be lamented that an act of tyranny against two exemplary characters, Boethius and Symmachus, his father-in-law, closed his career. These senators were both put to death on the mere suspicion of an intrigue between a senatorial party and the imperial court. This cruel act had no sooner been perpetrated than Theodoric was seized with remorse; and a fever ensued, which terminated his life in three days, in 526, the seventy-second year of his age, and fifty-second of his reign over the Goths, and thirty-third over the conquered provinces of Italy. The ordinary residence of this king was at Ravenna, above which city his daughter Amalasuntha (left Regent of Italy until the majority of one of her nephews) erected a splendid monument to his memory. See Gibbon's *Decline and Fall*, and the article *ГОТЪ*.

**THEODOSIUS**, surnamed the Great, a Roman Emperor, was the son of a distinguished general of the same name, who was executed for the alleged crime of treason, at Carthage, in 376. He was born about 346 in Spain. At a very early age he obtained a separate command; but on the execution of his father he sought retirement, until selected by the Emperor Gratian, in 379, for his partner in the empire. To his care were submitted Thrace and the

eastern provinces, which he delivered from an invasion of the Goths, whom he signally defeated in two battles, concluding a peace with them in 382. On the defeat and death of Maximus at Aquileia (388) he became the sole head of the empire, Gratian having been previously killed in the war against Maximus. He administered the affairs of the West in the name of Valentinian, the son of Gratian, then a minor. He entered Rome in triumph in 389, and passed three years in Italy. In 390 a sedition took place in Thessalonica, which resulted in the murder of the governor and several of his officers. The resentment of Theodosius was natural and merited; but the manner in which he displayed it was in the highest degree detestable and inhuman. An invitation was given to the emperor's name to the people of Thessalonica to an exhibition at the circus, and when a great concourse of spectators had assembled they were massacred by a body of barbarian soldiery to the number, according to the lowest computation, of 7000. Theodosius was at this time at Milan, of which St. Ambrose was bishop, and this prelate, on account of such an atrocious proceeding, resolutely refused him communion for eight months; the docile, and it is to be hoped repentant, Theodosius humbly submitted. About this time the pious emperor crowned his merits, as a foe to paganism, by demolishing the celebrated temple of Serapis and all the other heathen temples of Egypt; and he also issued a final edict prohibiting the ancient worship altogether. On the murder of Valentinian by Arbogastes, and the advancement of Eugenius in his place (392), the emperor carried on a war against the latter, which finally terminated in his defeat and death. Theodosius did not long survive this success; but after investing his sons, Arcadius and Honorius, with the Eastern and Western Empire, he was carried off at Milan by a dropsical disorder, in January, 395, in the fiftieth year of his age, and sixteenth of his reign. Theodosius distinguished himself by his zeal for orthodoxy, and his intolerance and persecution of Arianism and other heresies. He was doubtless a man of considerable abilities, and possessed many public and private virtues, which, however, will scarcely excuse the fierceness of his intolerance, or the barbarity of his anger and revenge. See Gibbon's *Decline and Fall*.

**THEOGONY** is the name given to the class of poems which treat of the generation and descent of the gods. The most ancient Greek theogony known to us is that of Hesiod, the earlier Theogonies of Muses and Orpheus having perished.

**THEOLOGY** (Greek *Theos*, God, and *logos*, doctrine) is the science which treats of the existence of God, his attributes, the relations in which he stands to us, our state and history as spiritual and moral beings, and the Divine will regarding our actions, present condition, and ultimate destiny, and other subjects connected with these. The term *theologia* was first used by Plato and Aristotle, and applied by them to the productions of their theogonists; and of those who speculated on the nature, government, and worship of God. Homer, Orpheus, Muses, Hesiod, &c., were called *theologoi* (theologians); and Plato himself was, by some of his successors, deservedly honoured with the same title. Aristotle gave the name of theology to metaphysics, dividing theoretical philosophy into three parts, *physical*, *mathematical*, and *theological*. This word does not occur in the Bible. The fathers of the church of the third and fourth centuries applied it peculiarly to that part of Christian doctrine which treats of the divinity of Christ. Hence the apostle John, in the title which from early times has been prefixed to the Book of Revelation, is called 'the divine,'

or *theologian*, because he insists on that doctrine more than any other inspired writer; and Gregory Nazianzen was greeted with the same epithet because of his orations on that subject. They spoke, in like manner, of the theology of the Trinity. Abelard was the first to apply the term to the entire science of the Christian religion, a comprehensive signification which it still bears. In reference to the sources whence it is derived theology is distinguished into *natural* or *philosophical* theology, which relates to the knowledge of God from his works by the light of nature and reason; and *supernatural*, *positive*, or *revealed* *theology*, which sets forth and systematizes the doctrines of the Scriptures. With regard to the contents of theology it is classified into *theoretical* *theology* or *dogmatics* (see **DOGMATICS**), and *practical* *theology* or *ethics* (see **ETHICS**). As comprehending the whole extent of religious science, theology is divided into four principal classes, *historical*, *exegetical*, *systematic*, and *practical* *theology*. Historical theology treats of the history of Christian doctrines, of heresies, of the church, of councils, and so on. Exegetical theology embraces the interpretation of the Scriptures (see **EXEGESIS**), the science which teaches the principles to be observed in interpretation (see **HERMENEUTICS**), and Biblical criticism, which examines and tries to establish the genuine text, the authenticity of the various books of the Bible, and the discussion of kindred subjects. *Systematic* *theology* arranges methodically the great truths of religion, so as to enable us to contemplate them in their natural connection, and to perceive both the mutual dependence of the parts and the symmetry of the whole. *Practical* *theology* consists of an exhibition, first, of precepts and directions; and secondly, of the motives from which we should be expected to comply with these. *Apologetic* and *polemic* theology, which are frequently treated as separate branches, belong to several of the above-mentioned four classes at once. The *Scholastic* *theology* attempted to clear and discuss all questions by the aid of human reason alone, laying aside the study of the Scriptures, and adopting instead the arts of the dialectician. During the dark ages its champions acquired great celebrity, and were honoured by the titles of Angelic and Seraphic Doctors, and the like. Their speculations are now almost forgotten, and their works are seldom or never read. The *mystical* *theology* referred almost everything to the intellectual light, and the secret emotions which in various ways, and more especially by contemplation and an austere discipline, might be excited and cherished in the human heart. A new era in the history of theology was introduced by the philosophy of Kant, who developed and systematized a new theological theory, which more or less makes the belief in a religious doctrine dependent on its demonstrability by reason. See **RATIONALISM**.

**THEOPHRASTUS**, a celebrated Peripatetic philosopher, a native of Eresus, in the island of Lesbos, was the son of a fuller. He was born early in the fourth century B.C., and studied at Athens, in the school of Plato, and afterwards under his rival Aristotle, of whom he was the favourite pupil and successor. His original name was Tyrtamus, which his master, in admiration of his genius and eloquence, is said to have changed into that of Theophrastus, or the fine speaker, and afterwards for that of Theophrastus, or the divine orator, by which he is familiarly known. On the departure of Aristotle from Athens after the judicial murder of Socrates he became the head of the Peripatetic school of philosophy, where 2000 students are said to have attended his lectures. His fame extended to foreign countries: kings and princes solicited his friendship; and he was treated with particular attention by Cassander, the sovereign

of Macedon, and Ptolemy Lagos, the king of Egypt. Theophrastus composed a multitude of books—dialectic, moral, metaphysical, and physical—the titles of 200 being specified by Diogenes Laërtius. We possess two entire works of his on botany, but only fragments of his other works, such as those on Stones, of the Winds, &c.; and his Characters, or Ethic Portraits, by far the most celebrated of all his productions, and the model of numerous imitators, including the moral satirist La Bruyère. Some of his moral sentences are striking: for example, 'Respect yourself, and you will have no occasion to blush before others'. He died in 287 B.C., according to some accounts at the age of eighty-five, according to others at the age of 106 or 107. To his care we are indebted for the preservation of the writings of Aristotle, who, when dying, intrusted them to the keeping of his favourite disciple. The text of Theophrastus is in many passages very corrupt. The chief edition of his works, without the Characters, is that of Wimmer (1854-62); and among the editions of his Characters may be noticed that of Sir R. C. Jebb (1870), the latter with an English translation.

**THEORY**, a word used in several significations, the most important being a reasonable or scientific explanation to account for certain phenomena, either physical or moral. *Theory* is distinguished from *hypothesis* by the latter depending much more on mere guesswork than the former.

**THEOSOPHY** (from Greek *theos*, God, and *sophia*, wisdom), according to its etymology the science of divine things. But the name of *theosophists* has generally been applied to persons who in their inquiries respecting God have run into mysticism, as Jacob Böhm, Swedenborg, and others. At the present day the term is applied to such doctrines or beliefs as those of the Theosophical Society, a society founded in New York in 1875 by Col. Olcott, the objects of which are: to form the nucleus of a universal brotherhood of humanity, and to investigate unexplained laws of nature and the psychical powers of man. The study of oriental literature and science is to be promoted at the same time, in the belief that much occult knowledge is possessed by 'wise men of the East', of which we in the West are still ignorant. Among the leaders of the movement have been Olcott, A. P. Sinnet, Madame Blavatsky, an American Russian, and Mrs. Annie Besant. This modern theosophy is an attempt to give a philosophical explanation of evil and a basis for ethics by means of re-incarnation and the law of Karma, or of cause and effect. Man is conceived as a sevenfold being, or as a manifestation of the universal spirit on seven planes. The three highest aspects of his being constitute the immortal Ego, and through alternate periods of existence in the body and in a non-material world he evolves towards that perfect union with the absolute which is the destiny of all men. See works by those above mentioned.

**THERAPEUTÆ**. See **ESSENES**.

**THERESA**, St., a religious enthusiast, born at Avila, in Spain (Old Castile), on March 28, 1515. At an early age the perusal of the Lives of the Saints inspired her with the desire to become a martyr; and she left her home with one of her brothers to seek death at the hands of the Moors. Being brought back she erected a hermitage in her father's garden for retirement and devotion. She took the veil among the Carmelites at Avila at the age of nineteen. Her rapturous piety and religious zeal inspired general admiration; and being dissatisfied at the relaxation of discipline which she noticed in the order to which she belonged she undertook to restore the original severity of the institution. She founded the first convent of reformed Carmelite nuns at Avila in

1562. (See **CARMELITES**.) She lived to witness the foundation of thirty convents for her followers; and members of the order subsequently obtained settlements in most Catholic countries. She died at Alba on the 4th of October, 1582, and was canonized by Pope Gregory XV. in 1622. Her chief works are an autobiography and mystical books, such as *The Way of Perfection* and *The Castle of the Soul*.

**THERESIOPEL**, MARIA - **THERESIOPEL** (Hungarian, *Sabudka*), a royal free town in Hungary, in the county of Bács-Bodrog, 25 miles south-west of Szegedin. It is properly rather a district than a town, as it covers, with its numerous so-called suburbs, an area of more than 600 square miles. It has manufactures of boots, and linen and woollen cloth, dye-works, tanneries, soap-boiling works; grows tobacco and fruit, and rears cattle. It has a trade in horned cattle, horses, hides, and wool. Pop. (1880), 61,367; (1890), 74,038; (1900), 82,122.

**THERMÆ** (from the Greek *thermai*, signifying originally warm or hot springs), properly warm baths, but also applied generally to the baths of the ancients. (See **BATH**.) During the Roman Empire the buildings for this purpose were constructed with great splendour, and adorned with paintings, statuary, libraries, gymnasia, and public walks. The baths of Nero, Titus, Caracalla, and Diocletian at Rome were distinguished for the magnificence and luxury displayed in their construction.

**THERMIDOR**. See **CALENDAR**.

**THERMODYNAMIC ENGINE**, any form of heat engine; steam-engines and gas-engines are thermodynamic engines. See next article.

**THERMODYNAMICS**, the science of heat considered as energy. Suppose a leaden bullet of 2 lbs. is dropped from the top of a building 64·4 feet high, it will reach the ground in two seconds, having a velocity of 64·4 feet per second, and just before striking it has, in the shape of kinetic energy,  $2 \times 64\cdot4$  (168·8) foot-pounds (*poundals*). This kinetic energy may be estimated in another way, it is  $\frac{2 \times (64\cdot4)^2}{2 \times 32\cdot2}$ ;

thus we have the two forms in which energy may be expressed— $m h$ , where a pressure  $m$  has overcome an equal and opposite pressure through a height  $h$ ; and  $\frac{m v^2}{2g}$ , where  $m$  is a mass of matter,  $v$  is a velocity

in feet per second, and  $g$  is the velocity which gravity produces per second. Readers may doubt if we are justified in describing a pressure as overcoming an equal and opposite pressure; a force which lifts a weight in opposition to gravity is stronger than gravity, and hence the weight acquires a velocity upwards; but if the weight is to come to rest at a certain height, while it is losing this velocity gravity is stronger than the force, and, neglecting the slight opposition of the air to the motion of a body through it, the mean pressure upwards is the same as the mean pressure downwards. The bullet, when it strikes the ground, is flattened, and abrades the ground; the change of place by falling, the flattening, and the abrasion answer to the commercial notion of work. The energy or work represented by

the number 168·8 has imparted  $\frac{168\cdot8}{1390}$  units of heat

jointly to the bullet and the ground where it fell. Thus the energy of potential  $m h$ , the energy of the bullet at the top of the wall, has been converted into kinetic energy  $\frac{m v^2}{2g}$ , the energy of the bullet at the

bottom, and this again into  $\frac{m h}{J}$  units of heat (where  $J$  is Joule's equivalent in Centigrade units), the heat value of the energy after the bullet has struck the



ground. Suppose the same bullet shot from an air-gun to a height of 64·4 feet, then the air effective in

propelling the ball in expanding will lose  $\frac{168 \cdot 8}{1890}$  units of heat, and the mutations of energy will be in the opposite direction from those in the previous example. We have, in these examples, assumed the *first law of thermodynamics* as being true. This law is expressed by the equation  $W = JH$ , where  $W$  is the work in poundals,  $H$  the heat, and  $J$  Joule's equivalent.

A thermodynamic or heat engine is a machine by means of which a percentage of the heat lost by one body, called the source, on account of its connection with another body called the refrigerator, is converted into kinetic energy or mechanical effect and made available for the performance of work. The efficiency of a heat engine is the ratio of the heat available for mechanical effect to the total heat taken from the source. Suppose we have a cylinder containing a gas which presses against a piston fitted to the cylinder:—(1) Let the gas expand at constant temperature till it has absorbed heat  $H$ ; (2) let the gas still expand, but without absorbing heat, till its temperature is  $t - \tau$ ; (3) let the gas be compressed at the constant temperature  $t - \tau$  till the quantity of heat lost is  $h$ ; (4) let the gas be further compressed, without loss or gain of heat, till its temperature is  $t$ , and suppose that the third process has just been stopped at the point from which the last process would bring the gas to its original volume as well as its original temperature. The heat  $H$  absorbed by the gas expanding at the temperature  $t$  is greater than the heat  $h$  withdrawn at the temperature  $t - \tau$ , and consequently the mean pressure of the piston outwards has been greater than its mean pressure inwards, and this excess of pressure has value towards mechanical

effect. The efficiency of the engine is  $\frac{H - h}{H}$ . This engine is a reversible engine; because, if the mean outside pressure in lbs. against the piston inwards, multiplied by the distance moved in feet, exceed the mean inside pressure multiplied by the same distance, by  $J(H - h)$ , the gas will be heated, or the body called the source, which is supposed to be at the original temperature of the gas, will receive  $H$  units of heat,  $h$  of which have been withdrawn from the

refrigerator. It may be easily shown that  $\frac{H}{h} = \frac{T}{T - \tau}$ , whence the efficiency is  $= \frac{\tau}{T}$ , where  $T$  is the temperature of the source above the absolute zero

( $-273^\circ \text{C}$ ), and  $\tau$  the difference in temperature between the source and refrigerator. A reversible engine is called a perfect engine, because it is the most efficient engine between the temperatures of its source and refrigerator.

The second law of thermodynamics is—the efficiency of a completely reversible engine is independent of the nature of the working substance, and depends only on the temperatures at which the engine takes in and gives out heat; and the efficiency of such an engine is the limit of possible efficiency for any engine. See HEAT, JOULE'S MECHANICAL EQUIVALENT OF HEAT, PRINCIPLE OF THE CONSERVATION OF ENERGY, &c.

**THERMO-ELECTRICITY**, electricity produced at the junction of two metals, or at a point where a molecular change occurs in a bar of the same metal when the junction or point is heated above or cooled below the general temperature of the conductor. Fig. 1 represents an experiment which illustrates the production of a thermo-electric current. Three sides of a rectangular frame are formed of a piece of sheet copper, and the two free ends are connected by a short bar of bismuth. The apparatus being placed

in the magnetic meridian, as indicated by the needle shown in the figure, heat applied by means of a spirit lamp to a junction of the copper and bismuth will cause a current from the bismuth to the copper, and the deflection of the needle will show the existence of this current and its direction. A thermo-electric current will also be generated in a copper wire if the wire has been twisted or knotted for a short distance so as to form a point at which there is a slight change in the molecular condition of the wire by heating or

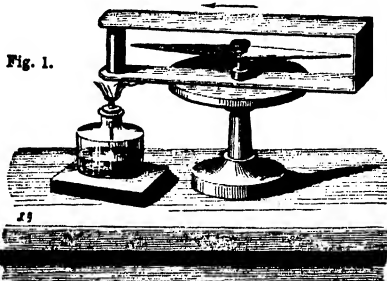


Fig. 1.

cooling this point. A series of metals has been arranged in the order of the direction of the current when the junction is heated, and numbers are given which indicate the electro-motive force when any two metals are employed. Such a series exists only for one range of temperature, and the numbers giving the proportional electro-motive force only hold for a very short range of temperature. When the general temperature is considerably raised the direction of the current between two metals of the series may be reversed—for instance, heating a junction of zinc and iron when the general temperature is  $0^\circ \text{C}$ . gives a current from zinc to iron, but if the general temperature is  $300^\circ \text{C}$ . the current is from iron to zinc. The point of temperature at which the current ceases, just before a second current is originated in the opposite direction, is called the 'neutral point.' We give the following table on the authority of Mathiessen, the general temperature for which the series and numbers hold being about  $16^\circ \text{C}$ ., the order of the table being the direction of the current when a junction is heated:—

Bismuth.....	25	Tin.....	1
Cobalt.....	9	Copper.....	1
Potassium.....	6·5	Platinum.....	0·7
German silver.....	5·2	Silver.....	0
Nickel.....	5	Gas coke.....	-0·96
Sodium.....	5	Zinc.....	-0·2
Mercury.....	2·5	Iron.....	-5
Aluminium.....	1·3	Antimony.....	-10
Magnesium.....	1·2	Tellurium.....	-179
Lead.....	1·03		

A series of little bars of bismuth and antimony soldered together and arranged in the compact form shown on the top of the stand at the left of fig. 2, having one half of the junctions forming the end seen, and the other half forming the opposite end of the pile, in connection with a delicate galvanometer, seen at the right of the figure, form what is called a *thermo-multiplier*—an arrangement very much used in experiments with radiant heat. Referring to the table given above the electro-motive force for any two metals is found by subtracting the numbers opposite the metals. Thus between bismuth and copper the electro-motive force is 24 times that between copper and silver (the electro-motive force with a copper and silver junction is taken as unity), and between antimony and bismuth it is 35; between antimony and tellurium it is 205; but tellurium is a difficult metal to obtain, and hence *thermo-piles* for experimental purposes are made of alternate bars of bismuth and antimony. The thermo-multiplier is the most delicate thermometer for radiant

heat, deviations of the galvanometer needle showing the very slightest differences of temperature between the two ends of the pile. The pile is called Nobili's pile, from Nobili the inventor, and the whole arrangement of pile and galvanometer is called Melloni's

thermo-multiplier. Seebeck in 1821 first drew attention to the phenomena of thermo-electricity; and Cumming, Becquerel, and Thomson, as well as Nobili and Melloni, have further investigated and made practical application of the discovery of Seebeck.

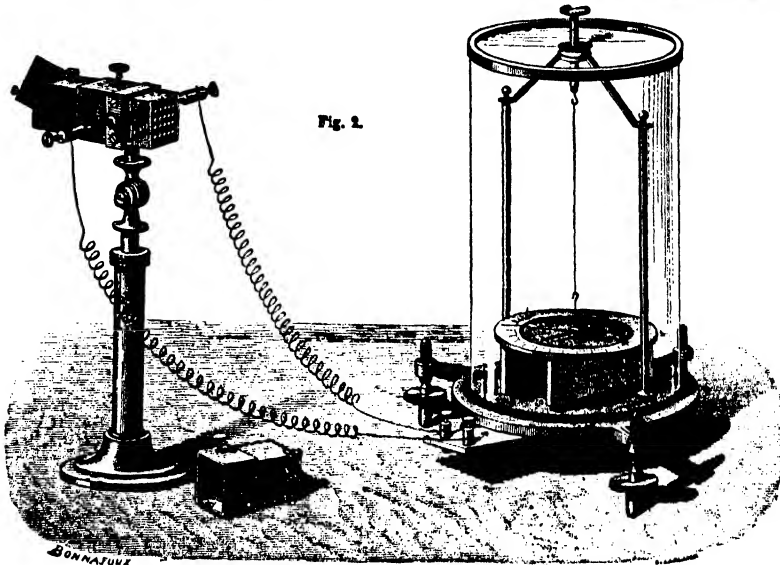


Fig. 2.

Peltier showed in 1834 that if a current of electricity from a battery is caused to pass through a thermo-pile the alternate junctions are heated and cooled by the current, and the thermal effects are such as to send a current in opposition to the current from the battery.

**THERMOMETER**, an instrument for indicating temperature. All bodies possess heat, and all bodies are continually exchanging heat by means of conduction and radiation. Two bodies are at the same temperature when, if they are placed in contact, neither increases its quantity of heat at the expense of the other. The arrangement called a thermometer should give the same indication when it is successively placed in contact with two bodies at the same temperature. In all instruments for measuring temperature, except the thermo-multiplier (see THERMO-ELECTRICITY), the indication is derived from the unequal expansion of two or more bodies. Breguet's metallic thermometer consists of a helix formed of three strips of different metals soldered together to form one ribbon. The outer strip of the helix is platinum, the middle one gold, and the other silver. The free end of this helix has an index attached to it, and is placed over a dial. Heat causes the helix to unwind, and a decrease of heat causes it to wind, the amount of unwinding and winding being shown by the motions of the index against the dial. The most common thermometers are those which exhibit the unequal expansion of a glass containing vessel and some fluid contained in it. The form of glass vessel is usually a fine tube, having a bulb blown at one end; the bulb and a portion of the stem are filled with mercury, alcohol, or air, and the varying length of stem filled by the fluid indicates variations of temperature. Suppose a mercurial thermometer, like that in the figure, has a bulb whose capacity at 0° C. is  $\frac{1}{100}$  cubic inch, and whose stem has a bore of  $\frac{1}{100}$  square inch; and suppose that at 0° C. the bulb and 1 inch of stem are filled with mercury, there will be  $\frac{1}{100}$  cubic inch of mercury; suppose the temperature is raised 1°, the mercury becomes  $\frac{1}{100} +$

$\frac{1}{100} \times \frac{1}{100}$  cubic inch, or  $\frac{1}{100} \times \frac{1}{100}$  cubic inch; the volume of the portion of the glass occupied by the mercury at first becomes, in like manner,  $\frac{1}{100} \times \frac{1}{100}$  cubic inch, so that we have  $\frac{1}{100} (\frac{1}{100} + \frac{1}{100})$  cubic inch of mercury additional in the stem, which quantity, divided by the enlarged sectional area of



the bore of the stem, would give the length of the first degree on the stem. Thermometers are never graduated by calculation, and we give the above example to explain what is meant when the apparent expansion of mercury in glass is spoken of. It is important that the tube chosen for a thermometer should be as nearly as possible uniform in bore; and to test the tube in this respect a short thread of mercury is introduced, and its length measured when it is moved to different parts of the tube; it should be always of nearly the same length. A proper tube having been chosen, a bulb is blown at its extremity, and mercury is introduced by repeated heating of the bulb; the bulb is always allowed to cool when the end of the stem is in connection with mercury, which will be drawn in to fill the bulb. The filled bulb and stem are now heated to somewhat above the highest temperature the thermometer is intended to indicate, and the stem is melted and sealed at a suitable distance from the bulb. There is now no air in the tube. To mark the zero point on the stem the instrument is placed in melting ice, and the position of the mercury at this temperature is marked 0° on the Centigrade scale; the point marked 100° is found when the instrument is placed in the vapour of water boiling under a barometric pressure of 760 millimetres. Between these points the stem is divided into 100 equal parts called degrees. Below the zero the graduation may be continued, and degrees in this direc-



tem are counted negative; above the boiling-point also the graduation may be continued. Mercury freezes at about  $-39^{\circ}\text{C}$ ., and consequently in thermometers for temperatures lower than  $-39^{\circ}\text{C}$ . alcohol must be the liquid employed. The rate of expansion of mercury is very regular from a few degrees above its freezing-point to  $100^{\circ}\text{C}$ ., but above  $100^{\circ}$  irregularity in the rate of expansion becomes apparent. The most regularly expanding substance is a fixed gas, such as air, and consequently an air thermometer is the most reliable. Air thermometers are not so convenient as mercury thermometers. A good deal of confusion has arisen on account of the existence of three thermometric scales. On the Centigrade scale the point of melting ice is marked  $0^{\circ}$ , and the point of boiling water is marked  $100^{\circ}$ . On the Réaumur these points are marked  $0^{\circ}$  and  $80^{\circ}$ ; and on the Fahrenheit  $32^{\circ}$  and  $212^{\circ}$  respectively. A simple proportion transfers a temperature given according to one scale to the corresponding number on either of the others.  $90^{\circ}\text{F}$ . is equivalent to  $(90 - 32) \times \frac{5}{9}$ ,  $32\frac{2}{3}^{\circ}\text{C}$ .; or to  $(90 - 32) \times \frac{5}{9}$ ,  $25\frac{1}{3}^{\circ}\text{R}$ . Thermometers for indicating very high temperatures are called pyrometers. Leslie's differential thermometer indicates the difference in temperature between two glass bulbs containing air, and connected by a bent tube containing some sulphuric acid, which forms an index. For additional information see MAXIMUM THERMOMETER and MINIMUM THERMOMETER.

**THERMO-PILE.** See THERMO-ELECTRICITY.

**THERMOPYLÆ**, a narrow defile in Greece, leading from Thessaly into Opuntian Locris, between Mount Œta and the sea (the Maliac Gulf, now the Gulf of Zeitouni), 25 miles north of Delphi. It was often called by the Greeks simply *Pylæ* (gates). The name of *Thermopylæ* was due to the warm springs (*thermæ*) hard by. It is 5 or 6 miles long, and was in ancient times only 50 or 60 paces (in the narrowest part only 20 feet) wide, but is now, owing to the growth of alluvial deposits, a plain of several miles in breadth, traversed by the river Spercheios (now Hellada), which anciently entered the Maliac Gulf some distance to the north of the pass. As Thermopylæ forms the only road by which an army can pass from Northern into Southern Greece it has on several occasions been defended against invaders, and it is chiefly celebrated for its defence by 300 Spartans, together with allies, under Leonidas, against the Persian host under Xerxes, in 480 B.C. (See LEONIDAS.) In 279 B.C. an army of Greeks held the pass against an army of Gauls till it was lost by treachery, as in the Persian invasion. The pass was afterwards forced by Philip V. of Macedonia against the Ætolians in 207 B.C., and by the Romans against Antiochus the Great of Syria in 181 B.C.

**THESEUS**, a mythical king of Athens and a famous hero of antiquity, son of Ægeus by Æthra, the daughter of Pittheus of Troezen, in Peloponnesus. He was educated at Troezen, at the house of Pittheus, and passed for the son of Poseidōn (Neptune). When he came to years of maturity he was sent by his mother to his father, and a sword and sandals were given him by which he might make himself known to Ægeus in a private manner. (See ÆGEUS.) The road which led from Troezen to Athens was infested with robbers and wild beasts; but these were overcome by his courage. On arriving at Athens he narrowly escaped being poisoned by Medea, who was living with Argæus; but his father recognized the sword, and received Theseus as his successor on the throne. He next caught alive the wild Marathonian bull; but a much more important service was the slaying of the Minotaur and the freeing of Athens from the tribute of seven youths and seven maidens annually sent to Crete to be devoured by

that monster. (See MINOTAUR.) This task he accomplished by the help of Ariadne (see ARIADNE), whom he had the meanness to abandon on his homeward voyage in the Island of Naxos. The rejoicings which his return might have occasioned at Athens were interrupted by the death of Ægeus, who threw himself into the sea when he saw his son's ship return, as it did through the neglect of Theseus, with black sails, which was the preconcerted signal of ill success. He succeeded his father as ruler of Athens. The Athenians were governed with mildness, and Theseus made new regulations and enacted new laws. The number of the inhabitants of Athens was increased; a court was instituted, which had the care of all civil affairs; and Theseus made the government democratical, while he reserved for himself only the command of the armies. To him also the Athenians ascribed the union of the towns of Attica into a single state, with Athens at the head, and the division of the people into the three classes of Eupatridæ, Geomori, and Demiurgi (nobles, husbandmen, and mechanics). Perhaps the most celebrated of the events in the career of Theseus after the slaying of the Minotaur was his war with the Amazons. He is said to have invaded their territory and carried off their queen, Antiope (according to another account, that with which the readers of Chaucer and Shakspeare are familiar, Hippolyta). The Amazons in their turn invaded Attica, and a battle was fought in the city of Athens itself. Theseus was victorious, and the Amazons driven out of Attica. (See ATTICA.) Pirithois, king of the Lapithæ, invaded the territories of Attica; but when Theseus marched out to meet him, the two enemies, struck at the sight of each other, cordially embraced; and from that time began the most sincere friendship, which has become proverbial. Theseus was present at the nuptials of his friend, and fought most courageously with the Lapithæ in defence of the bride Hippodamia and her female attendants against the attempts of the Centaurs. When Pirithois had lost Hippodamia he agreed with Theseus, whose wife was also dead, to carry away some of the daughters of the gods. Their first attempt was upon Helen. After they had obtained the prize they cast lots, and she became the property of Theseus; but the resentment of Castor and Pollux soon obliged him to restore her into their hands. Theseus now assisted his friend in procuring a wife, and they descended into the infernal regions to carry away Persephonê (Proserpine). Pluto, apprised of their intentions, fastened both heroes to a rock near the entrance of the lower world. When Hercules came to steal the dog Cerberus he released Theseus from his punishment, his guilt being less than that of Pirithois, as he had only shared the adventure from friendship. During the captivity of Theseus in the Kingdom of Pluto (see PHÆDRA), Menestheus, one of the descendants of Erechtheus, ingratiated himself into the favour of the people of Athens and obtained the crown. Theseus attempted to eject the usurper, but to no purpose. The Athenians had forgotten his services; and he retired to the court of Lycomedes, king of Scyros, who, either jealous of his fame or bribed by Menestheus, threw him down a deep precipice. In 469 B.C. his bones, or what were supposed to be so, were found by Cimon in Scyros, and brought to Athens, where they received a magnificent burial. Statues and a temple (the Theseum) were raised; and festivals and games were publicly instituted to commemorate his actions. A portion of the temple still remains standing. What shreds of history, if any, there may be in the accounts of Theseus cannot be ascertained.

**THESIS** (*thesis*, position, formed from *tithēmi*, I put or lay down), in the schools, a general proposition which a person advances and offers to maintain.

In logic every proposition may be divided into thesis and hypothesis. Thesis contains the thing affirmed or denied, and hypothesis the conditions of the affirmation or negation. Thus 'if a triangle and parallelogram have equal bases and altitudes (hypothesis) the first is half of the second' (thesis). For *arais* and thesis see *RHYTHM*.

**THESPI**, a native of a village near Athens, lived in the time of Solon, in the sixth century B.C., and is considered the inventor of tragedy, as he added to the dithyrambic choruses of the feats of Bacchus an actor, who, when the chorus was silent, generally recited a mythical story; and probably carried on dialogues with the leader of the chorus, appearing successively in different characters in a piece. He is also said to have been the inventor of the masks which the Greek actors always wore in performing. The date of his first representation is 535 B.C. See *DRAMA*.

**THESSALONIANS, EPISTLES TO THE.** Both of these epistles were written by St. Paul to the church at Thessalonica, in all probability during his long stay at Corinth, and therefore not very long after the foundation of the Thessalonian church on St. Paul's second missionary journey. A note at the end of each of the epistles in our Authorized Version states that they were written from Athens, but there can be little doubt that this is erroneous. In the beginning of the third chapter of the first epistle the writer intimates that he was at Athens when he sent Timothy on a mission to the Thessalonians, and the sixth verse of the same chapter makes it clear that Timothy had already returned from this mission before the epistle was written. Now the narrative of the Acts shows that Paul did not make a long stay at Athens in all, and that he certainly cannot have remained long there after he was joined by Silas and Timothy, who came to Athens by another route (compare Acts xvii. 15, 16, 33; xviii. 1). The inference is that St. Paul had left Athens before the first epistle was written, and as the place he next visited was Corinth, where he made a stay of eighteen months, and as this is the only place where Paul made a prolonged stay while he was accompanied by Silas and Timothy, as the opening verse of both epistles indicates that he was at the time of their writing, there is no room to doubt that they were both written from Corinth. The date of the epistles thus depends on the date of St. Paul's stay in Corinth. It lies most probably between 52 and 54. They are the earliest of Paul's writings; and when compared with his other epistles are seen to be characterized by greater simplicity of style, as manifested in the connection of the thoughts, the structure of the sentences, and the mode of expression. The contents of the first epistle are chiefly words of encouragement to the infant church, commendations of the zeal they had hitherto shown, mingled with exhortations to steadfastness and warnings against the danger of relapsing into the practices that prevailed among them before they joined the Christian church. The epistles conclude with the special injunction of various Christian duties. The second epistle, after some expressions of consolation to the Thessalonians on account of the persecutions they had had to suffer, goes on to disabuse their minds of the belief that they seem to have entertained, and partly to have derived from St. Paul's own words in the first epistle (ch. iv. 15-v. 3), that the day of judgment was then imminent, on which account some among them appear to have neglected their ordinary duties. The apostle rebukes those who have been doing so, and exhorts them all to work patiently and diligently as he had done while among them, and not to be led away by busybodies. The genuineness of the first epistle was questioned by

Baur, but his view has met with little acceptance. The second epistle, however, is regarded as non-Pauline by a large number of critics.

**THESSALONICA.** See *SALONICA*.

**THESSALY, THESSALIA**, the north-eastern division of ancient Greece proper, bounded on the north by the Cambunian Mountains, separating it from Macedonia; on the west by the chains of Pindus and Tymphrestus, separating it from Epirus; on the south by Mount Ceta, separating it from Ætolia, Doris, and Locris; and on the east by the Ægean Sea. The rich plain inclosed between these mountains belongs almost entirely to one river basin, that of the Peneios (Salambría), which traverses it from west to east, and finds an outlet into the Theraic Gulf through the vale of Tempe. In the earliest times Thessaly proper is said to have been inhabited by Æolic and other tribes (Boeotians, Minyæ, Achæans, Perrhæbi, Hestiei). It was also the land of the semi-fabulous Centaurs and the Lapithæ. The name of Thessaly was derived from the Thessali, a Greek people who are said to have come into this land from the west, from Thesprotia, in the south of Epirus, and who became the governing class in the country, having succeeded in making the original inhabitants tributary, but leaving them individual freedom without political rights. Thessaly was broken up into four separate confederacies, and long exerted no important influence on the affairs of Greece generally; but it rose for a brief period to a position of greater consequence when (about 375 B.C.) Jason of Pheræ, having got himself elected tagus, or common ruler of the confederacies, brought the whole of Thessaly completely under his power, and began to aim at making himself master of the whole of Greece. But this scheme was checked by his assassination in 370 B.C. Thessaly afterwards became dependent on Macedonia, and finally was incorporated with the Roman Empire. After the fall of the Byzantine Empire Thessaly came, with the rest of the imperial dominions, into the hands of the Turks, and till recently formed a part of the Ottoman Empire, although the majority of the inhabitants are Greeks. The greater portion of it was in 1881 incorporated in the kingdom of Greece, to which it forms an important addition, being now divided into the nomarchies of Arta, Larissa, and Trikkala, with a pop. (1896) of 397,459. The ancient Thessalians were celebrated as horsemen, as their land was for its breed of horses. The Thessalian women had an evil repute as witches and poisoners.

**THETFORD**, a municipal borough and market-town in England, partly in the county of Suffolk and partly in that of Norfolk, on both banks of the Ouse, here crossed by a handsome iron bridge, 79 miles N.N.E. of London. It has, besides churches and chapels, a grammar and other schools; and the remains of a Cluniac priory, of a nunnery, and some other religious structures. The manufactures comprise an iron-foundry, a patent pulp-goods factory, two agricultural-machine factories, some breweries, malting establishments, a flour-mill, and a tan-yard. Pop. (1891), 4247; (1901), 4613.

**THETIS**, a daughter of Nereus and Doris, therefore one of the Nereids. Being wooed by Peleus, king of the Myrmidons, in Thessaly, she changed herself into a thousand forms to avoid his embraces; but Peleus obtained the same power of transformation by the instructions of Proteus or Chiron, and she was at length obliged to yield. The nuptials were celebrated on Mount Pelion, and were honoured by the presence of all the gods except Eris or Discord, who was not invited, and who, to avenge the slight, threw in among the company the apple of discord. (See *ERIS* and *PARIS*.) By Peleus she became the mother of Achilles. See *ACHILLES*.

**THIAN-SHAN**, or **CELESTIAL MOUNTAINS**, an extensive range of Central Asia, stretching generally north-east and east from the Pamir plateau, and separating Zungaria and the basin of the Ili river in the north from the basin of the Tarin and the Desert of Gobi in the south. It extends from about 66° to about 96° E. longitude, and from about 40° to about 44° N. latitude. Five principal chains with several subordinate ones have been distinguished, not including the Ala-tau mountains on the frontiers of Zungaria or the Alai mountains of Ferghana. Many sections of the range have special names. The highest summit is Khan-Tengri (24,000 feet), near Issik Kul lake, on the frontiers of Chinese and Russian Turkestan.

**THIBET.** See **TIBET**.

**THICK-KNEE**, **NORFOLK PLOVER**, or **STONE CURLEW** (*Edicnemus crepitans*), a species of Grallatorial or Wading Birds, nearly allied to the Charadriadæ or Plovers, and included in the sub-family of the Edicneminae. It occurs in England from April to September, being especially abundant in the sandy districts of Norfolk. The colour is brown, mottled with black, the head being brown with black streaks. A light streak runs from the forehead to the ear-coverts. The chin and throat are white, the neck and breast being pale-brown, whilst the abdomen is white. The average length of this bird is 17 inches. The eggs number two, and are of light-brown colour, marked with slaty-blue. They are deposited on the bare ground, and the males are believed to aid in the duties of incubation. The song-note consists of a clear whistling sound. The food consists of slugs, worms, insects, frogs, and like fare.

**THIELT**, a town in Belgium, in the province of West Flanders, 14 miles S.E. of Bruges. It has a town-house surmounted by a Gothic tower, a college, and a technical and other schools. Its principal manufactures are linen goods, lace, &c. Pop. (1897), 10,339.

**THIERRY**, **JACQUES NICOLAS AUGUSTIN**, a celebrated French historian, was born at Blois on the 10th of May, 1795. He received his education in the college of his native town, entered the Normal School (at Paris) in 1811, and in 1813 obtained the appointment of teacher in a provincial school. The following year he quitted this occupation and returned to Paris, where he embraced with ardour the socialistic views of St. Simon, and became his secretary and his coadjutor in his literary works, and in 1816 published a treatise of his own, entitled *Des Nations et de leurs Rapports Mutuels*. He, however, did not fail to perceive the theoretical vagaries of his master, from whom he separated in 1817, when he became, along with Comte and Dunoyer, one of the conductors of the journal *Le Censeur Européen*. Shortly afterwards he became a contributor to the *Courrier Français*, in which, in 1820, he published ten letters on the history of France, which attracted considerable attention. His celebrated work on the Norman conquest of England, *Histoire de la Conquête de l'Angleterre par les Normands*, was published at Paris in 1825, and by the interest of the narrative, brilliance of style, and novel mode of treating the subject, attained great success both in France and in England. From the closeness of his application to work M. Thierry became in the following year almost entirely blind, and at the same time was attacked by a nervous disorder. These afflictions were endured by him with great fortitude, and he still pursued his literary labours, making use of the assistance of his friends. An enlarged edition of the letters formerly written by him for the *Courrier* newspaper appeared in 1827, under the title of *Lettres sur L'Histoire de la*

France. In 1830 he was elected a member of the Academy of Inscriptions. In 1834 he published, under the title of *Dix Ans d'Études Historiques*, a series of admirable essays, contributed by him to various periodicals. About this time he was summoned by Guizot, then minister of public instruction, to Paris, and intrusted with the editing of the *Recueil des Monuments Inédits de L'Histoire du Tiers État*, for the collection of documents relative to the history of France. To this publication he prefixed an *Essai sur L'Histoire de la Formation du Tiers État*, which was separately published in 1853. In 1840 he published *Récits des Temps Mérovingiens*, which gained for him the Gobert prize of the Academy of Inscriptions. He died on the 22nd of May, 1856. His wife gained some distinction in the literary world by a work entitled *Scènes de Mœurs aux Dix-huitième et Dix-neuvième Siècles*, published in 1836; and contributed also some able essays to the *Reveu des Deux Mondes*.

**THIERS**, a town in France, in the department of Puy-de-Dôme, on the crest and side of a hill washed by the Durdolle, 21 miles N.N.E. of Clermont. Its elevated site gives it a very striking appearance when viewed from a distance, but its houses, though solidly built, are huddled together without any regularity, in steep, narrow, winding streets. It has two ancient churches and the remains of an old castle; considerable manufactures of cutlery and iron-mongery, paper, candles, leather and leather articles, and some trade. Pop. (1896), 12,200.

**THIERS**, **LOUIS ADOLPHE**, French statesman and historian, was born at Marseilles, 15th April, 1797. He was educated in the Lyceum of Marseilles until he began the study of the law at Aix, where he passed advocate about 1819. He made no great figure at the bar, and, desirous of a larger theatre for his ambition, he set out for Paris in 1821 to seek his fortune. Having got an appointment on the staff of the *Constitutionnel*, then the leading journal, he soon acquired by liberal pay, and latterly by the gift of a share in the *Constitutionnel*, complete independence. Journalism soon ceased, however, to supply sufficient stimulus to his active intellect, and he undertook his *Histoire de la Révolution*, having as his colleague Felix Bodin, whose name appeared along with his in the first two volumes. The work was completed in 1827, in ten vols. 8vo. On the formation of the Polignac cabinet, Thiers founded, in conjunction with Armand Carrel and Mignet, the *National*, the first number of which appeared on 1st January, 1830. The new democratic organ exercised a decisive influence on public opinion, and the famous ordinances, the signal for the revolution of July, were now issued. Upon this Thiers counselled the issuing by the journalists of a revolutionary manifesto. It was signed by forty-three names. Orders having been given for the arrest of Thiers, he fled, on the night of the 28th, to the neighbourhood of Saint Denis, accompanied by Mignet and Armand Carrel. Louis-Philippe, having consented to be named King of the French, Thiers was soon named a councillor of state, and attached to the department of finance. He was elected deputy for Aix, and after the death of Casimir Périer became minister of the interior in the cabinet of Soult, 11th October, 1832. He next filled the offices of minister of commerce and minister of public works, and again became minister of the interior, but in consequence of differences with Soult and Gérard he gave in his demission, 11th November, 1834, but soon resumed office under Mortier. He again retired in February, 1836, but a few days after returned to power as foreign minister and president of the council. These offices, after many vicissitudes, he again held in March, 1840. A picturesque

incident in his administration was the bringing of the remains of Napoleon from St. Helena to France. Taking a strong interest in the Eastern question he declared in favour of Mehemet Ali of Egypt against Turkey; but neither the king nor the chambers wished to resort to extremities, and the policy of Thiers having received a grave check he retired from the cabinet on the 29th of October (1840). He now devoted himself to historical pursuits, and his *Histoire du Consulat et de l'Empire*, begun in 1845, was completed in 1862, in twenty vols. 8vo. The revolution of February, 1848, found him prepared to accept the republic; and he was a member, first of the Constituent and then of the National Assembly. After the *coup d'état* of 1851 he was banished from France, but returned in August, 1852. After an absence of twelve years from public life he was chosen in the elections of 1863 deputy for the department of the Seine, and was re-elected in 1869. In this position he regained much of his early popularity. He combated energetically the project of war against Prussia, because France was unprepared, and after the disaster of Sedan visited the courts of London, Vienna, St. Petersburg, and Florence to seek assistance against Prussia; but all that he could obtain was a promise that the four great powers would support the proposal of an armistice. Accordingly Thiers proceeded to the head-quarters of the King of Prussia at Versailles to open negotiations for peace. But he was unsuccessful, and Prussia proceeded to a war *à outrance*. On February 17th, 1871, he was elected chief of the executive power of the republic (being subsequently president), and on the 21st opened negotiations with Bismarck, which resulted in the peace with Germany. Thiers retained office as president till the 24th of May, 1873, whereupon Marshal Macmahon was appointed president. When Macmahon began to put himself in opposition to the republic, Thiers acted in complete harmony with the republican chiefs of the two chambers, notably with M. Gambetta, to whom, on September 3d, 1877, he gave a meeting at Paris to read to him, and to several other politicians, a manifesto which he had just completed. But that very day he was attacked with congestion of the brain, and died at night. Thiers was *par excellence* the representative of his country; a witty writer; and an accomplished debater. He was also genial, unselfish, large-hearted; and to establish the glory of France was the main secret of his measures and counsels.

THIONVILLE (German, *Diedenhofen*), a town formerly in France, now in Alsace-Lorraine. It stands on a level plain on the left bank of the Moselle, is walled, and otherwise fortified. In the Franco-German war it was invested after the battle of Gravelotte, and after the fall of Metz it was besieged with vigour. On the 25th of November, 1870, it was occupied by the Germans. It suffered very severely by the siege. It has manufactures of gloves, thread, nets; several saw-mills and tanneries; a trade in corn, hemp, and flax; and an important annual fair. Pop. (1890), 8928; (1900), 10,060.

THIRLWALL, CONNOP, an English historian, born at Stepney, Middlesex, February 11, 1797; died at Bath July 27, 1875. He was educated at the Charter-house and at Trinity College, Cambridge, where he obtained a fellowship. He afterwards studied for the law, and was called to the bar in 1825. Having exchanged the law for the church he was ordained in 1828, and some years after received the living of Kirby Underdale, in Yorkshire. Here he added to his pastoral duties a variety of literary labours. The first of his works published by himself (his father had previously issued a number of essays and poems written by him in extreme youth) was a translation of Schleiermacher's Gospel of St.

Luke, to which he prefixed an introduction. This work appeared anonymously in 1825. His next work was a translation of the first two volumes of Niebuhr's History of Rome, in conjunction with Archdeacon Hare (1828-31). Then followed the work to which he chiefly owes his reputation—his History of Greece, the first edition of which appeared in Lardner's Cabinet Cyclopædia, in eight volumes, between 1835 and 1844. It was well received, and before the appearance of Grote's history (the first two volumes of which were published in 1846) was without a rival in the English language. Grote himself praises it for the learning, sagacity, and candour it displays, and said that if it had appeared a few years earlier he should probably never have conceived the design of his own work. In 1840 Thirlwall was presented by Lord Melbourne to the see of St. David's, which he held till within little more than a year of his death. He was also for a time one of the editors of the Cambridge Philological Museum, and during the closing years of his life was a member of the committee for the revision of the Old Testament. He was the only bishop who spoke and voted for Gladstone's bill for the disestablishment of the Irish church. See Perowne's editions of his Remains, Literary and Theological (1877), and Essays, Speeches, and Sermons (1880); Stanley's edition of his Letters to a Friend (1881); Stoke's edition of his Letters, Literary and Theological (1881); and Morgan's Four Biographical Sketches (1892).

THIRSK, a market-town in England, in the North Riding of York, 21 miles north by west of York. It consists of the old and new towns, separated by a small stream, over which are two stone bridges, and of the suburb of Sowerby. It has a spacious market-place, a handsome church in the later English style; and manufactures of agricultural implements and saddlery, and some malting and brewing. Thirsk ceased to be a parliamentary borough in 1885. Pop. (1891), 13,016; (1901), 12,710.

THIRST, the term applied to denote the sensations experienced in animals from the want of water. The sensations of thirst are generally referred to the fauces or posterior portion of the mouth and palate; but these symptoms are merely to be regarded as the local manifestation of a general or systemic condition, for by moistening the parched and dry fauces thirst is alleviated but for a short time only, whilst by the introduction of fluids into the stomach, blood-vessels, intestines, or skin, the condition is permanently relieved. When the watery elements of the blood have been greatly diminished or obstructed thirst becomes naturally most intense and declared; or similarly, when saline matters are added to the blood in excess, the sensations of thirst are produced. The nerves of the fauces therefore are to be regarded as merely the accredited means for warning us of the need for fluids, although the conditions which induce and relieve thirst are participated in by the body as a whole. It has formed a subject of dispute amongst physiologists as to whether or not the skin by absorbing fluids can assuage the pangs of thirst; or, more properly, whether water or fluids may really be absorbed by the skin. See SKIN.

THIRTY TYRANTS. See GREECE (ANCIENT)—History, and ROME—History.

THIRTY YEARS' WAR (from 1618 to 1648), a war in Germany, at first a struggle between R. Catholics and Protestants, but subsequently it lost its religious character and became a struggle for political ascendancy in Europe. On the one side were Austria, nearly all the R. Catholic princes of Germany, and Spain; on the other side were, at different times, the Protestant powers, and France. The occasion of this war is to be found in the fact that

Germany had been distracted ever since the Reformation by the mutual jealousy of Roman Catholics, Lutherans, and Calvinists, which led the Protestant princes to form a Union in 1608, against which the R. Catholic League was formed the following year. (See GERMANY.) Certain concessions had been made to the Protestants of Bohemia by the Emperor Rudolph II. (1609), but these were withdrawn by his successor Matthias in 1614, and four years afterwards the Bohemian Protestants were in rebellion. Thus began the first part of the long war, the part that is known as the Bohemian war. The Protestant Bohemians were led by the Count of Thurn, and the Union sent an auxiliary corps into Bohemia, under the command of the brave Ernest, count of Mansfeld. Their leaders drove the imperial troops from Bohemia, invaded the Archduchy of Austria, and advanced to the gates of Vienna, but unfavourable weather and want of resources compelled the invaders to retreat. Soon after, Ferdinand, with the title of Ferdinand II., was chosen emperor (August 28, 1619). He had borne the title of King of Bohemia since the resignation of his cousin Matthias in 1617. The Bohemians, knowing his hostility to Protestantism, had already declared his title to the Bohemian crown void, and offered it to the elector palatine, Frederick V., the head of the Protestant Union, and husband of Elizabeth, daughter of James I. of England. Frederick accepted the crown, but he was ill fitted to cope with the difficulties before him, and the great victory of the troops of the league (8th November, 1620), under Maximilian of Bavaria, on the Weissenberg (White Mountain), near Prague, which was followed by the flight of the new king, put an end to the Bohemian rebellion, and crushed the Protestant cause in that quarter. Frederick was put under the ban of the empire, his territory was taken from him and bestowed on Maximilian of Bavaria.

Ferdinand had now a favourable opportunity of concluding a peace on moderate terms. But his unsparing treatment of the conquered, and the reactionary proceedings against the Protestants generally, all of whom had been expelled from Bohemia, at last roused the determined opposition of the Protestant princes, who sought and obtained foreign assistance. Aided by supplies of money from England, and by a body of troops from Holland, Count Mansfeld, Christian of Brunswick, and the Margrave of Baden again took the field, and they were joined by Christian IV. of Denmark. Mansfeld was defeated by the imperial general Wallenstein at Dessau (1626), and after a difficult march through Hungary to the lower Danube, died in Bosnia on the 30th of November in the same year. Meanwhile Christian of Brunswick had also died, and Christian of Denmark had been defeated by Tilly at Lutter am Barenberg, and compelled to withdraw to his own territory (1626). The allies of Denmark, the dukes of Mecklenburg, were now obliged to flee from their territories, which were taken possession of by Wallenstein with the consent of the emperor. Holstein, Schleswig, and Jutland also soon fell into the hands of the imperial troops. Pomerania and Brandenburg had detachments forced upon them by Wallenstein. The power of the emperor extended to the Baltic, and to secure this power an attempt was made to seize all the important towns on the coast. Stralsund alone made serious resistance, and during a ten weeks' siege, which was carried on with furious energy (May to July, 1628), it baffled all the attacks of Wallenstein, who was at last forced to retreat with great loss. This check thwarted the plans of Wallenstein, and led to a short interruption of the war. In the peace of Lübeck (May, 1629) Christian of Denmark received back all the territories belonging to him that

had been occupied and devastated by the imperial troops, on the condition of promising to interfere no more in the affairs of Germany.

Austria was once more victorious; but the greater its victory the more complete was to be the triumph of the Roman Catholic Church. With this object the emperor issued the Edict of Restitution, in virtue of which all the ecclesiastical foundations and other church property that had been confiscated for the behoof of Protestants since the religious peace of Passau (1552) were to be restored to the Roman Church, and the Calvinists were to be excluded from the benefits of that peace. This ordinance, which threatened to take a large number of bishoprics, and almost all the abbeys and other ecclesiastical foundations of North Germany, out of the hands of those who then held them, filled all Protestant Germany with alarm and prolonged the war. Many princes and towns refused to obey it, and the emperor was obliged, in order to give effect to it, to keep his forces in the field. But these forces did not long remain under the command of Wallenstein. At a meeting of the Electoral College of the empire in August, 1630, Ferdinand found it expedient to yield to the general demand for his deposition, and the supreme command of the imperial armies was given to Tilly, who thereupon marched against Magdeburg, which had refused to carry out the edict.

In the meantime a new belligerent appeared on the scene, one whose exploits form the most interesting episode of the whole war. This was Gustavus Adolphus, king of Sweden, who landed on the coast of Pomerania on the 24th of June, 1630. The inducements which led him to mix himself up with the struggle were the desire of protecting Protestantism in Germany, that of establishing the power of Sweden on the coast of the Baltic, and that of checking the advance of the power of Austria in North Germany. For this last reason he had the secret support of the French minister Richelieu, who was jealous of the growing power of the house of Hapsburg. Gustavus Adolphus was generally hailed by the inhabitants of the Protestant states of Germany as their deliverer, but the Protestant princes did not extend to him so eager a welcome. Fearing the revenge of the emperor they for the most part refused his offered alliance, and at the diet of Leipzig resolved to maintain a neutral attitude. The old Duke of Pomerania, whose territory had been terribly devastated by the imperial troops, had at once opened his land to him, but the Electors of Brandenburg and Saxony refused him a passage through their territories, and while the time was consumed in negotiations the town of Magdeburg, after repeated assaults, was taken and destroyed (May 10, 1631). Tilly now threatened Saxony, and the elector, John George I., hastened to conclude, in his own defence, the alliance which he refused in the interests of the Protestant cause. On the 7th of September the forces of Tilly and Gustavus Adolphus met at Breitenfeld, close to Leipzig, when the former were completely defeated. Tilly retreated to the south, while the Swedish king advanced to the Main and Rhine. Before the end of winter the latter had made himself master of the Bishopric of Würzburg and the greater part of the Lower Palatinate, as well as of the towns on the Rhine. In the spring of 1632 he marched by way of Nürnberg to the Lech, on the banks of which Tilly had taken up a strong position. On the 15th of April this position was forced by the Swedes, and Tilly was mortally wounded during the engagement. After placing a garrison in Augsburg, Gustavus Adolphus, accompanied by the former Elector Palatine, Frederick V., advanced as far as Munich, the Bavarian capital. Meantime the emperor had in his distress again

turned to Wallenstein, and induced him by entreaties and great concessions to undertake to levy and command a new army. After a successful operation against the Saxons, Wallenstein joined the Bavarian troops in Bohemia and marched with them into Franconia, where the Swedes had posted themselves strongly not far from Nürnberg. On arriving there Wallenstein took up another strong position in the neighbourhood, and fortified a camp. Here the two armies lay for months facing one another without coming to a pitched battle; till at last Gustavus found that the resources of the neighbourhood were exhausted, and resolved to venture upon an attack on the enemy's camp. But in spite of the bravery of the assailants, the attack, again and again renewed, was always repulsed. Gustavus Adolphus was obliged to give up the hope of success in his attempt, and soon after he led his troops into Saxony. Thither Wallenstein followed him, and on the 6th of November, 1632, a battle was fought at Lützen, near Leipzig, in which Wallenstein was defeated, but in which the victorious Swedes lost their king and leader.

After the death of Gustavus Adolphus the direction of the war was assumed by the Swedish chancellor Axel Oxenstierna, who, in the first place, got the Protestant princes and towns of the Franconian, Swabian, and the two Rhenish circles of the Germanic Empire to promise in the Heilbronn Convention to uphold the Swedes until the victory of the Protestant cause should be secured. The principal generals who acted under him were Bernhard von Weimar, and the Swedish general Horn. France furnished supplies of money. Bavaria was laid waste by the Swedes, who, since the death of their king, carried on the war in as barbarous a manner as the imperial troops, who were now quartered in Silesia. In this province and in Bohemia Wallenstein lingered without exhibiting any of the energy that was demanded of him by the imperial court. This slackness, together with other circumstances, caused him to be suspected of entering into treasonable negotiations with the enemy, and Ferdinand ultimately deposed him and placed him under the ban of the empire, in consequence of which he was murdered by some of his own officers (February 25, 1634). After this the imperial army moved into Bavaria, and on the 6th of September, 1634, gained a complete victory over Bernhard von Weimar at Nördlingen. Several German princes, the principal of whom was the Elector of Saxony, who had never been well inclined to the Swedes, now thought it convenient to conclude separate peace with the emperor, and the people generally began to cherish the hope of soon seeing the termination of the war. The separate peace with Saxony, the peace of Prague, was concluded in May, 1635, and in it Saxony received the whole of Lusatia as a hereditary possession, while the emperor virtually gave up the edict of restitution.

The hopes raised among the people of Germany by this and other separate peace were far from being confirmed. Germany itself was almost unanimous in desiring peace, but the Swedes thought it their interest to continue the war in order not to lose the advantages they had gained, and France now determined to take a more active part in the war, with the view of abasing the house of Hapsburg and extending the French frontier to the Rhine. Richelieu promised to the Swedes important aid in money and troops, and the war was renewed with greater vigour than had been shown since the death of Gustavus Adolphus. The Swedish general Baner conquered and rendered desolate Saxony and Thuringia (1636); Bernhard von Weimar took Rheinfelden, Freiburg, and Breisach, and formed the scheme of creating for himself an independent principality on

both banks of the Rhine, but was stopped short in his career by death in July, 1639. In the midst of these events the emperor had died (February, 1637), and had been followed by his son Ferdinand III., a man of milder and less energetic temper than his father, but as firmly attached to the Catholic faith, and equally inclined to force it on his subjects.

In the autumn of 1640 the new emperor assembled a diet at Ratisbon to deliberate over the best method of conducting the war, and while this council was sitting, Baner, who had for the last few years been constantly engaged in the east of Germany, conceived the audacious plan of leaving his winter quarters and taking the whole council, along with the emperor, prisoners (January, 1641). A sudden thaw prevented the execution of this scheme, by melting the ice on which he had hoped to cross the rivers. Baner died during the retreat. He was succeeded in the command of the Swedish army by Torstenson, the ablest of the generals who proceeded from the school of Gustavus Adolphus. Although generally confined by the gout to a sedan chair, he astonished the world by the rapidity of his movements. He vanquished the imperial armies near Leipzig (Breitenfeld, 1642), advanced into Moravia with the intention of penetrating into Austria and attacking the emperor in his capital, then suddenly appeared in Schleswig and Holstein and put to flight Christian IV. of Denmark, who had lately allied himself with the emperor and brought an army into the field (1643). Later (August, 1645), Wrangel, another Swedish general, forced Christian to accept a disadvantageous peace. After his victory over Christian IV., Torstenson again turned south, and having destroyed two imperial armies, one under Gallas and the other under Hatzfeld and Götz, in conjunction with Rakoczy, prince of Transylvania, once more threatened Vienna (1645). But the emperor was again delivered from the danger. The withdrawal of Rakoczy obliged Torstenson to give up his design; and in the following year, worn out by disease, he resigned his command, which was taken up by Wrangel. Meantime the French had been operating on the Rhine and in the west of Germany. After the death of Bernhard of Weimar they had taken his army into their pay. At the head of this army Guebriant obtained several successes, but towards the close of 1643 suffered a severe defeat in which his army was in great part destroyed. He himself was mortally wounded soon after. In the following year neither of the French generals Enghien and Turenne was able to gain any considerable advantage; but on the 3d of August, 1645, the Austrian general Mercy was defeated at Allersheim, near Nördlingen, after which the junction of the French and Swedes was inevitable. Late in the summer of 1646 their united armies advanced through Suabia and Bavaria, and in the armistice of Ulm (March, 1647) compelled Maximilian of Bavaria to fall away from the emperor. In the following year further successes were gained, and Wrangel was on the point of uniting his forces with those of the other Swedish general Königsmark who had penetrated into Bohemia, when the news reached the armies that the Peace of Westphalia, which had been negotiating for five years at Münster and Onabrück, was concluded. By a singular coincidence it happened that the last blow of the war was struck at the place where the war originated, Prague. Königsmark had taken one part of the town, and was preparing to attack the other when he was stopped by the news of peace. For a statement of the settlement made by this peace see WESTPHALIA (PEACE OF).

In addition to the misery which such a war could not but produce while it raged, the Thirty Years' war had other ill effects on Germany of a more last-



ing nature. In the first place, it increased the power of the petty princes, and thus led to the keeping up of expensive courts, numerous standing armies, and a superabundance of government officials, all of which implied heavy taxation. The benefits to learning which resulted from this state of affairs cannot, however, be overlooked. Secondly, it brought about the decline of trade and manufactures, which had removed their seats to other lands. Many of the great commercial and industrial towns of Germany were now impoverished. Thirdly, it destroyed German art and literature. For nearly a century and a half after the war foreign influences prevailed in every branch of culture.

For more detailed accounts of the Thirty Years' war and its results, besides Schiller's well-known history, the following may be referred to: *Der Dreissig-jährige Krieg vom militärischen Standpunkte*, by Karl du Jarrys von la Roche (three vols., 1848-52); *The Thirty Years' War*, by Samuel R. Gardiner (1874); *Gindely's Geschichte des Dreissigjährigen Kriegs* (four vols., 1869-80, tr. into Eng.), *Illustrierte Geschichte* (1882-84), and *Beiträge* (1900); *Ritter's Deutsche Geschichte im Zeitalter der Gegenreformation* (three vols., 1890-1900); *Winter's Geschichte des Dreissigjährigen Kriegs* (1893).

**THISBE.** See PYRAMUS AND THISBE.

**THISTLE**, the popular name of various flowering plants of the natural order Compositæ, especially of species of the genera *Carduus* and *Cnicus*, belonging to the section of the order characterized by having all the florets tubular. In *Carduus* the pappus is pilose, whilst in *Cnicus* it is plumose. The flowers are generally purple in colour, and nearly always hermaphrodite, and the receptacle is covered with chaffy bristles. Several species are very common in Britain. The name Scotch Thistle is often given to the Cotton Thistle, *Onopordon acanthium*, a doubtful native of Scotland, which has other species with much more claim to this designation, and more worthy to stand for its national emblem, such as *Carduus lanceolatus*. Some of the thistles are a great nuisance to farmers, while others are eaten as vegetables—the Milk Thistle (*Carduus marianus*) for instance, and the cotton thistle. America possesses several native species of thistle, and European species have also established themselves there and in Australia. In Argentina thistles grow to a great size and form impenetrable thickets. See **CARDUUS**, **CARLINE-THISTLE**, **SOW-THISTLE**, &c.

**THISTLE, KNIGHTS OF THE, OR KNIGHTS OF ST. ANDREW**, according to some writers instituted by Achaius, king of Scots, in memory of an appearance in the heavens of a bright cross resembling that whereon St. Andrew suffered martyrdom, seen by Achaius the night before he gained a victory over Athelstan, king of England. But the truth is, that there is no known mention of the thistle as the national badge of Scotland before the reign of James III., in the inventory of whose effects it occurs in that way. A collar of gold thistles surrounds the royal ensign in Sir David Lindsay's armorial register of 1542. But no order of knights taking its name from the thistle existed till 1687, when statutes were issued for the creation of such an order, and eight knights were nominated by James VII. (James II. of England). No nominations were made during the reign of William and Mary, but the order was revived by Queen Anne on the 31st of December, 1703. The insignia of the order consist of a gold collar composed of thistles connected by the interlaced stalks of some other plant; the jewel suspended by a green ribbon from the collar, and consisting of a figure of St. Andrew in the middle of a star with eight pointed rays; and the star, which

is of silver and is eight-rayed, four of the rays being pointed, while the alternate rays are shaped like the tail-feathers of a bird, and which has a thistle in the centre, surrounded by a band bearing the motto, 'Nemo me impune lacessit'. The style of the order is, The Most Ancient and Most Noble Order of the Thistle. The order consists of the sovereign and sixteen knights, besides extra knights (princes), and a dean, a secretary, the lyon king of arms, and the gentleman usher of the green rod.

**THISTLEWOOD**, ARTHUR, the son of a farmer in Lincolnshire, born in 1770, a notorious character, who, after a life of gambling and dissipation, became the principal agent in the memorable Cato Street conspiracy (so called from the meeting-place of the conspirators in London), the object of which was to murder several members of the administration at a cabinet dinner, and excite an insurrection in the city of London. The day selected for carrying out the plot was that fixed for the funeral of George III. at Windsor, when all the military would be out of London to take part in the funeral procession. This absurd scheme was betrayed by a man employed as a spy by the ministry, and the insane projectors were arrested just as they were about to proceed to the execution of their purpose (February, 1820). Being tried and condemned as a traitor, Thistlewood, with four of his coadjutors, suffered the sentence of the law, May 1, 1820.

**THOMAS, CHRISTIANS OF ST.** See **CHRISTIANS OF ST. THOMAS**.

**THOMAS, ST.**, also called **DIDYMUS** (the former being the Hebrew, the latter the Greek word signifying 'twin'), one of the twelve apostles. He is said to have been a native of Antioch. Eusebius says that his real name was Judas. He followed Jesus with the most devoted attachment; and the scene with his Master after the resurrection, in which the doubts that Thomas had expressed with great vehemence as to the fact of the resurrection were removed by the invitation of Christ to examine his wounds, is the chief of the three occasions on which he is prominent. He is said to have preached the gospel among the Parthians; but the particulars of his life are unknown. His grave was believed by the early church to be at Edessa, and Chrysostom mentions it as one of the four genuine tombs of the apostles, the other three being those of Peter, Paul, and John. Late traditions bear that Thomas went farther east than Persia, and was the founder of the church in Malabar, known as the Christians of St. Thomas; but this is doubtful. (See **CHRISTIANS OF ST. THOMAS**.) An apocryphal Gospel of Thomas is published in Tischendorf's *Evangelia Apocrypha*.

**THOMAS, ST.**, one of the group called the Virgin Isles, in the West Indies, sold to the United States by Denmark in 1902. It is 12 miles long and 2½ miles broad; area, 42 square miles. It has a rugged and elevated surface, which attains its greatest height towards the centre, and descends sometimes gradually, but oftener abruptly, to the shore. It was once well-wooded, but the trees have been cut down, which has laid the surface of the island open to the full force of the sun's rays, and has thus produced a great deficiency of water. The soil being mostly sandy, far the greater part of it remains uncultivated. The area under crop is only about 2500 acres, of which nearly a half is planted with sugar-cane. The trade used to be extensive, St. Thomas being a depot of goods for many of the neighbouring islands, and a great place of call for steamers trading to the West Indies; but times have changed. The chief town and the centre of trade is Charlotte-Amalie. Pop. (1890), 12,019.

**THOMAS, St. (São Thomé)**, an island in the Atlantic, near the coast of Guinea, belonging to Portugal, about 30 miles long and 18 broad; lat. 1° to 25' N.; lon. 6° 25' E.; area, with the island of Principe (a small island also belonging to Portugal, about 80 miles to the north-east), 454 square miles. The climate is hot, moist, and unwholesome to Europeans. The soil is fertile, and produces the fruits of the climate, especially coffee, cacao, sugar, indigo, and cotton. The island is well watered. In the centre is a high mountain, covered with wood and fruit-trees, and wrapped in almost perpetual clouds, from which descend a number of rivulets, which water the sugar-cane plantations in the valleys at the bottom. The chief town is Cidade. Pop., according to the census of 1900, 37,776.

**THOMAS À KEMPIS**, German mystic, was born in 1380 at Kempen, now in the Prussian Rhine Province. His usual surname is formed from the name of his native town, his proper surname being *Hamerken* or *Hämmerlein* ('Little Hammer'), Latinized as *Malleolus*. At the age of twelve he entered the school of the Brothers of the Common Life at Deventer, where his teacher was Florentius Radewin, a founder of the brotherhood, and about 1399 he took up his residence in the Augustinian monastery of Mount St. Agnes at Zwolle, established by the Brothers. He passed out of the novitiate in 1406, and was ordained priest in 1414, and he lived there, absorbed in literary and pious labours and greatly esteemed for saintliness, till his death on July 25, 1471. His numerous Latin works include a chronicle of his monastery, a life of the chief founder of the Brothers of the Common Life, Gerhard Groot, sermons, hymns, moral treatises, and other writings, but his fame rests wholly upon his celebrated devotional treatise entitled *Imitatio Christi*. This work, which appeared anonymously, was not all written at one period, and it underwent several revisions. It is in four books, entitled respectively: (1) *Admonitions Useful for a Spiritual Life*; (2) *Admonitions Concerning Inward Things*; (3) *Of Internal Consolation*; and (4) *A Devout Exhortation to the Holy Communion*. It has been claimed for Jean Charlier de Gerson (1363–1429), chancellor of the University of Paris, and even for others, but it is now generally accepted as the work of À Kempis. The first edition of the works of Thomas appeared at Utrecht in 1474, but it did not contain the *Imitatio*. The *Imitatio* has passed through an enormous number of editions in almost all languages, being indeed the most widely distributed book in the world after the Bible. Among recent editions are those of Hirsche (1874; 2nd ed., 1891), Gerlach (1889), and Wolfgruber (2nd ed., 1890). The English translation of 1889, with preface by the late Canon Liddon, is based on Hirsche's edition, and shows the rhythmic arrangement intended by the author. See Kettlewell's *Thomas à Kempis and the Brothers of the Common Life* (two vols., 1882), and Hirsche's *Prolegomena zu einer neuen Ausgabe der Imitatio* (three vols., 1873–93).

**THOMAS AQUINAS**. See **AQUINAS (THOMAS)**.

**THOMAS THE RHYMER**. See **RYMER**.

**THOMISTS**. See **AQUINAS** and **SCHOLASTICISM**.

**THOMPSON, BENJAMIN**. See **RUMFORD (COUNT)**.

**THOMPSON, SIR EDWARD MAUNDE**, palaeographer and bibliographer, was born in Jamaica on May 4, 1840, and was educated at Rugby and University College, Oxford. He was appointed an assistant in the British Museum in 1861, and ten years later became assistant-keeper of manuscripts, in 1878 keeper of manuscripts and Egerton librarian, and in 1888 principal librarian and secretary. In 1898 his official title as a servant of the British

Museum was changed to Director and Principal Librarian. He was called to the bar at the Middle Temple in 1867. In 1895–96 he was Sanders reader in bibliography at Cambridge. He was created a Companion of the Bath in 1893 and a knight commander in 1895, and he has received honorary degrees from the universities of Oxford, Durham, and St. Andrews, besides honours from France and Germany. For the Rolls Series he has edited *Chronicon Angliæ*, 1328–1388 (1874), *Chronicon Galfridi le Baker de Swynebroke* (1889), and *Adæ Murimuth Continuatio Chroniconum* together with *Robertus de Avesbury de Gestis Mirabilibus Regis Edwardi Tertii* (1889); for the Camden Society, *Letters of Humphrey Prideaux* (1875) and *Correspondence of the Family of Hatton* (1878); for the Hakluyt Society, *Diary of Richard Cocks in Japan* (1883); for the Royal Society of Literature, *Chronicon Adæ de Usk* (1876); and for the Hellenic Society, along with Sir R. C. Jebb, a facsimile of the *Laurentian Sophocles* (1885). In 1893 appeared his excellent Handbook of Greek and Latin Palaeography in the International Scientific Series. In 1902 he was appointed an original member of the British Academy.

**THOMPSON, SIR HENRY**, surgeon, was born at Framlingham, Suffolk, on Aug. 6, 1820. He was educated at University College, London, and in the London University examinations he gained distinction in chemistry, anatomy, and surgery. He was awarded the Jacksonian prize in 1852 for an essay on *The Pathology and Treatment of Stricture of the Urethra*, and again in 1860 for an essay on *The Healthy and Morbid Anatomy of the Prostate Gland*. In 1853 he became assistant-surgeon to University College Hospital, surgeon ten years later, professor of clinical surgery in 1866, and consulting surgeon in 1874. In 1884 he was professor of pathology and surgery to the Royal College of Surgeons. He has received numerous honours from foreign countries, was knighted in 1867, and created a baronet in 1899. His works treat mostly of the urinary organs and their diseases, of cremation, and of diet. To the first class belong, besides the essays above mentioned, *Practical Lithotripsy and Lithotomy* (1863); *Clinical Lectures on Diseases of the Urinary Organs* (8th ed., 1888); *On Suprapubic Lithotomy* (1885); and *The Preventive Treatment of Calculous Disease* (1888); and with these may be mentioned his treatise on *Tumours of the Bladder* (1884). In *Cremation, or the Treatment of the Body after Death* (1874) and *Modern Cremation, its History and Practice* (4th ed., 1901), he advocates the substitution of cremation for the present method of sepulture. The third group of his writings comprises *On Food and Feeding* (11th ed., 1901), and *Diet in Relation to Age and Activity* (18th ed., 1901). He has also written two novels, *Charley Kingston's Aunt* (1885), and *All But* (1886), and has exhibited pictures at the Royal Academy, the Salon, and elsewhere.

**THOMS, WILLIAM JOHN**, antiquary, was born in Westminster on Nov. 16, 1803. He early obtained a situation in the secretary's office at Chelsea Hospital, and in 1845 he was appointed a clerk in the House of Lords. From 1863 till 1882 he acted as deputy-librarian of the House of Lords, and during the period 1838–78 he was secretary to the Camden Society. He was elected a fellow of the Society of Antiquaries in 1838. In 1832 he started a short-lived paper called *The Original, but Notes and Queries*, founded in 1849, is still in existence. He acted as editor of the latter from its commencement to 1872. He died in London on Aug. 15, 1885. Among works edited by him are—



Early Prose Romances (three vols., 1827-28); *Lays and Legends of France, Spain, Tartary, and Ireland* (1834); *Lays and Legends of Germany* (1834); *Anecdotes and Traditions illustrative of Early English History and Literature* (1839), for the Camden Society; *Stow's Survey of London* (1842); and *The History of Reynard the Fox* (1844), for the Percy Society. His original works include: *The Book of the Court* (1838); *The Death Warrant of Charles I.* (1872); *Human Longevity, its Facts and its Fictions* (1873); and *Curl Papers* (1879). Thoms invented the word *folk-lore*, which he first used in an article in the *Athenæum* of Aug. 26, 1846.

THOMSON, SIR CHARLES WYVILLE, naturalist, son of a surgeon in the service of the East India Company, was born at Bonyde, Linlithgow, on March 5, 1830. After attending Merchiston School, Edinburgh, he entered the University of Edinburgh, where he took the medical course and showed great ability in botany and natural history. He was appointed lecturer on botany in King's College, Aberdeen, in 1850, and professor at Marischal College in 1851. Two years later he obtained the chair of natural history in Queen's College, Cork, and in 1854 he went to Queen's College, Belfast, as professor of mineralogy and geology. In 1860 he was transferred to the chair of natural science in the same college, and in 1868 he became in addition professor of botany in the Royal College of Science at Dublin. He returned to Scotland in 1870 to take up the chair of natural history in the University of Edinburgh. He took an active part in the scientific investigation of the British seas by the *Lightning* and *Porcupine* expeditions, and published an account of the results in a volume entitled *The Depths of the Sea* (1873). He was appointed in 1872 chief of the scientific staff of the *Challenger* expedition (which see in SUPP.), and on its return in 1876 he was knighted and selected to superintend the arrangement of the collections and the publication of the results. He died at Bonyde on March 10, 1882, before the work was completed. In *The Voyage of the Challenger: the Atlantic* (two vols., 1877) he gave a general account of part of the investigations carried out in the famous voyage.

THOMSON, JAMES, Scottish poet, was born in September, 1700, at Ednam, in Roxburghshire, where his father was parish minister. He received his earlier education in the parish school at Southdean, where his father had removed soon after his birth, and after attending school at Jedburgh he entered the University of Edinburgh in 1715. He at first intended to enter the ministry, but in 1725 he went to London—with good recommendations—to devote himself to literature, having already written a quantity of verse. His poem on *Winter* was published in the following year, and in 1727 it was followed by *Summer*. *Spring* appeared in 1728, and in 1730 the series was completed and published under the title of *The Seasons*. This first venture was very successful, and was followed by his play *Sophonisba*, produced at Drury Lane in 1730. For some time afterwards he was on the Continent as travelling tutor to the son of Charles Talbot, a future lord chancellor. He returned to England near the end of 1731, and after the death of his pupil in 1733 he was appointed by the young man's father to a sinecure office with a salary of £300 a year. Having resumed his poetic activity he published a patriotic poem entitled *Liberty* (1734-36), which was included in 1736 in the volume with *Sophonisba* and *Britannia*, the latter another patriotic effusion which he had issued in 1729. His patron died in 1737 and he lost his sinecure, but next year the Prince of Wales granted him a pension of £100

a year. His famous song, *Rule Britannia*, formed part of *The Masque of Alfred* (1740), written by him in collaboration with his friend David Mallet, with music composed by Dr. Arne. In 1744 his patron Lord Lyttelton conferred upon him the sinecure office of surveyor-general of the Leeward Islands, worth £300 a year. In the same year he issued a new edition of *The Seasons* with extensive additions and alterations, and in 1748 appeared *The Castle of Indolence: An Allegorical Poem*, a fine imitation of Spenser. He lost his pension early in 1748, and on Aug. 27 of that year he died from the effects of a chill. He was buried in the parish church of Richmond. Among his poems not already mentioned are: *A Poem Sacred to the Memory of Isaac Newton* (1727); *To the Memory of the Rt. Hon. Lord Talbot* (1737); *Agamemnon* (1738), a play; *Edward and Eleanor* (1739), a play which was published but rejected by the censor; *Tancred and Sigismunda: A Tragedy* (1745), his most successful play; and *Coriolanus* (1749), a posthumously acted play. Among his close friends were Pope, Quin, Garrick, Mallet, and other notable persons of that period. *The Seasons* marks the dawn of a new era in English poetry, an era characterized by a departure from the formalism and artificiality of Pope and his school in favour of simplicity and truthfulness to nature. The impulse gathered strength in Gray and Cowper, and reached its fullest expression in Wordsworth. The *Seasons* found warm admirers in France and other countries. A good recent edition of Thomson's complete works is the *Aldine* (1897) by D. C. Tovey. The best biography is Dr. Léon Morel's *James Thomson, sa Vie et ses Œuvres* (1895); see also the *Life* in Tovey's edition, and Bayne's *Thomson* (*Famous Scots series*, 1898).

THOMSON, JAMES, poet of pessimism, was born at Port-Glasgow on Nov. 23, 1834. While he was still a boy his father became paralysed and his mother died, and he was educated at the Royal Caledonian Asylum. He was afterwards trained at Chelsea for the calling of army schoolmaster, and in 1851 settled near Cork as a teacher. After teaching at various regimental centres he was discharged from the army along with several others for a breach of discipline in 1862. He had gained the friendship of Charles Bradlaugh, and contributed to his *National Reformer* over the signature B. V., that is, Bysshe (Shelley's second name) Vanolis (an anagram of Novalis). In 1872 he was in Colorado as agent of a mining company, and in the following year he went to Spain as a war correspondent. In 1874 he contributed to the *National Reformer* his most famous poem, *The City of Dreadful Night*, in which his gloomy temperament clearly shows itself. It was published separately, along with some other poems, in 1880. He was subject to dipsomania and insomnia, and his sad life ended on June 3, 1882, in University College Hospital, London. His other publications include: *Vane's Story*, *Weddah* and *Om-el-Bonain*, and other Poems (1881); *Essays and Phantasies* (1881); *A Voice from the Nile*, and other Poems (1884); *Satires and Profanities* (1884); and *Poems, Essays, and Fragments* (1892). His *Poetical Works* were issued in two volumes in 1895, and a volume of *Biographical and Critical Studies* appeared in 1896. See the *Life* by H. S. Salt (1889; revised edition, 1898).

THOMSON, JOHN, Scottish landscape-painter, was born on Sept. 1, 1778, at Dailly, Ayrshire, where his father was minister of the parish church. He was educated at the parish school, and studied for the ministry in Glasgow University for a year. In 1793 he entered the University of Edinburgh, and on his father's death in 1799 he succeeded him

as minister of his native parish. In 1805 he was presented to the parish of Duddingston, near Edinburgh, and here he rapidly acquired fame as a landscape-painter. His pictures were much in demand, and he exhibited frequently in Edinburgh. On the foundation of the Scottish Academy in 1830 he was elected an honorary member, after declining ordinary membership. He died on Oct. 28, 1840. Many of his pictures are in the National Gallery of Scotland, but a considerable number are held by private owners. Among the former are: Bruce's Castle of Turnberry; Ravenshaugh Castle; Scene on the Clyde; The Trossachs; Aberlady Bay; and Trees on the Bank of a Stream. The National Gallery in London contains Loch an Eilan, and the South Kensington Museum has a water-colour of Duddingston Loch. The writer of the notice in the Dictionary of National Biography says of him: 'Although lack of early and systematic training crippled his powers and prevented him from attaining full command of his mediums, Thomson was the greatest Scottish landscape-painter of his time, and the first to grasp and fitly express the ruggedness and strength of Scottish scenery'. There is a biography by W. Baird (1895).

THOMSON, JOSEPH, African explorer, was born at Penpont, Dumfriesshire, on Feb. 14, 1858. After an elementary education he worked in his father's freestone quarry for a time, but in 1875 he went to the University of Edinburgh to study geology and natural history. He distinguished himself so highly in his classes that he was appointed in 1878 geologist and naturalist to the exploring expedition sent out to East Central Africa by the Royal Geographical Society under the command of Alexander Keith Johnston. When Johnston died on June 28, 1879, Thomson assumed the leadership of the party and conducted it to Lake Tanganyika and near the head-waters of the Congo. A mutiny of his followers prevented him from proceeding farther, and he returned by way of Lake Leopold, reaching the coast on July 10, 1880. In 1881 he examined the alleged coal-beds of the Rovuma valley on behalf of the sultan of Zanzibar, and in 1882 he set out on a great journey from the east coast of Africa to Victoria Nyanza. This journey was undertaken on behalf of the Royal Geographical Society, and during it he visited Kilimanjaro and Mount Kenia, and proceeded through the country of the Masai by way of Lakes Naivasha and Baringo to Victoria Nyanza. On his homeward journey he explored Mount Elgon, and after many hardships he reached the coast in May, 1883. In 1885 he was awarded the founder's medal of the Royal Geographical Society, and in the same year he travelled in Nigeria on behalf of the National Africa Company in order to conclude treaties with the kings of Sokoto and Gando. In 1888 he explored the Atlas Mountains in Morocco, and in 1890-91 he travelled on behalf of the British South Africa Company in the territory of the Central Africa Protectorate. His health was permanently ruined, and on Aug. 2, 1895, he died in London. His travels are described in the following works: *To the Central African Lakes and Back: the narrative of the Royal Geographical Society's East Central African Expedition, 1878-80* (1881); *Through Masai Land: a Journey of Exploration among the Snowclad Volcanic Mountains and Strange Tribes of Eastern Equatorial Africa* (1885); and *Travels in the Atlas and Southern Morocco: a Narrative of Exploration* (1889). He also wrote a work on Mungo Park and the Niger (1890) and a novel *Ulu*, in collaboration with Miss Harris-Smith, in which he presents a psychological study of the native African mind. Besides these

separate works, he contributed many articles to geographical and other journals. See the *Life* by his brother, J. B. Thomson (1896).

THOMSON, THOMAS, antiquary, elder brother of Rev. John Thomson, the painter, was born at Dailly, Ayrshire, on Nov. 10, 1768. After receiving an elementary education in the parish school he entered Glasgow University and graduated M.A. in 1789. Adopting law as his profession, he went to Edinburgh, and was admitted an advocate in 1793. He acquired a large practice, but he gradually devoted himself more and more to the study of legal antiquities. In 1806 he was appointed to the new office of deputy clerk-register, and in this capacity he did excellent work on the Scottish records. He became a principal clerk of the Court of Session in 1828, and in 1839 he was removed from his deputy clerk-registership because of the unsatisfactory state of the finances of the register office. In 1832 he succeeded Sir Walter Scott, who was one of his close friends, as president of the Bannatyne Club. He died in Edinburgh on Oct. 2, 1852. His publications include: *The Acts of the Parliament of Scotland, 1424-1707* (ten vols., 1814-24), *Registrum Magni Sigilli Regum Scotorum, 1306-1424* (1814), *The Acts of the Lords Auditors of Causes and Complaints, 1466-94* (1839), and *Acts of the Lords of Council in Civil Causes, 1478-95* (1839), for the Record Commission; *Forms of Process in the Court of Session during the Earlier Periods, with the later variations* (1839); *A Collection of Inventories and other Records of the Royal Wardrobe and Jewel House, and of the Artillery and Munition in some of the Royal Castles, 1488-1606* (1815); *Chamberlain Rolls* (three vols., 1817 and 1845); *Memoirs of Sir George Mackenzie* (1821); *Memoirs of the Lives and Characters of the Right Honourable George Baillie of Jervisswood, and of Lady Grissell, by their daughter, Lady Murray* (1822); and several other editions of similar works. There is a memoir (1854) by Cosmo Innes.

THOMSON, THOMAS, a distinguished chemist, was born at Crieff on 12th April, 1773. He was educated at Crieff, Stirling, and the University of St. Andrews, and in 1799 he graduated M.D. at Edinburgh. In 1796 he succeeded his brother in the editorship of the *Encyclopædia Britannica*, to which he contributed the articles Chemistry, Mineralogy, and Vegetable, Animal, and Dyeing Substances. In the article Mineralogy he used the system of symbolic representation, but it is incorrect to describe him as the introducer of this auxiliary of chemical science. In 1800, on the completion of the *Encyclopædia*, he commenced a course of lectures on chemistry, which he continued till 1811, opening, in addition, a laboratory for practical instruction in chemistry, about the first institution of the kind in Great Britain. In 1802 he published the first edition of his *System of Chemistry*, which obtained rapid success both in this country and on the Continent, and received the warm commendations of Sir Humphry Davy and Sir Joseph Banks. In 1810 he published his *Elements of Chemistry*. His *History of the Royal Society* appeared in 1812. In 1813 he went to London and commenced there a scientific journal, the *Annals of Philosophy*, which he continued to edit till the end of 1820. The lectureship in Chemistry in Glasgow University was conferred on him in 1817, the office being shortly afterwards raised to a professorship, and he himself created regius professor of chemistry in 1818. His great work on the atomic theory was published in two volumes in 1825, under the title of *Attempt to establish the First Principles of Chemistry by Experiment*. Dr. Thomson discovered a large num-

ber of chemical compounds, such as hyposulphurous acid, chlorochromic acid, and a great variety of salts. In 1830-31 he published his *History of Chemistry* in two volumes, and in 1836 appeared his *Outlines of Mineralogy and Geology*. In 1846 he retired from his professional duties. He died 2d July, 1852.

THOR, son of Odin by Jörd (the earth), the Jupiter of the Germans, the God of thunder. He was represented as a powerful man in the prime of life, with a red beard, girt with his girdle of strength, and armed with his mighty hammer Mjölnir ('the smasher'). Sacrifices were offered up to him under oaks. *Thursday* has its name from him.

THORACIC DUCT, the name given to the central and terminal part of the lymphatic system (see LYMPH), which exists as a vertical canal lying in front of the spine, and which receives the terminations of the lacteal and lymphatic vessels. The thoracic duct is in fact the receptacle for the materials which go to renovate the blood, these materials being derived from the digestion of food and from the elaborated products of the lymphatic glands. And from the thoracic duct the chyle or nutrient matter is poured directly into the current of the circulation, the duct opening into the great veins (internal jugular and subclavian veins) lying at the root of the neck on the left side. A second and smaller lymphatic or thoracic duct lies on the right side of the body, and receives the contents of the lymphatics of the right arm and right side of the head. The chief thoracic duct is dilated at its lower extremity, at the junction of the loins and back, into a receptacle named the *receptaculum chyli*. The contents of the thoracic duct contain the elements of the blood already elaborated. In an executed criminal the analysis of its contents gave—water 90.48, albumen and fibrin 7.08, extractive matter 0.108, fatty matter 0.92, and saline matters 0.44.

THORAX, the name given to the bony structures in higher Vertebrates which form the chest or cavity containing the heart, lungs, and other viscera, and to those segments of the body in Arthropoda or higher Annulosa which succeed the head-segments, and lie before those of the abdomen. Thus in insects, we find three segments forming the thorax, named respectively the pro-thorax, meso-thorax, and meta-thorax. The pro-thorax bears the first pair of legs, the meso-thorax the second pair of legs and first pair of wings, whilst the meta-thorax bears the third pair of legs and second pair of wings. In Myriapoda (which see) the chest-segments are indistinguishable from those of the abdomen; and in Crustaceans (which see) and Arachnida (which see) the head and chest segments are united together to form a single mass, named the *cephalo-thorax*. In Crustacea seven or eight segments are variously regarded as belonging to the thorax. In man and higher Vertebrates the thorax is formed by the sternum (which see) or breast-bone in part, and by the ribs and spine, laterally and behind. (See CHEST.) In Mammals alone, is the thorax and its cavity completely shut off from the cavity of the abdomen by a complete *diaphragm* or midriff. See also RIB, SKELETON, &c.

THORIUM, a metal of the tin group, occurring naturally in combination in thorite, orangeite, euxenite, and other minerals. Its symbol is Th., and its atomic weight 232. It may be obtained either as an iron-gray powder of specific gravity 10.968 or in small cubical crystals of specific gravity 11.23. When raised to near a red heat it burns brilliantly with the production of the white oxide, ThO<sub>2</sub>, known as *thoria*. The latter oxide is used, along with zirconia, lanthana, yttria, and other oxides in the mantle of the Welsbach light for the production of brilliant incandescence. Other compounds are known.

THORN, a town of Prussia, in the province of West Prussia, 51 miles s.s.w. of Marienwerder, on the right bank of the Vistula. It is a place of great strength, surrounded by a number of detached forts on both sides of the river. It consists of an old and a new town, has old walls, an old castle, a fine town-house, a market-place, containing a colossal bronze statue of Copernicus, who was born here, &c.; manufactures of machinery, castings, steam-boilers, soap, and famous gingerbread; some shipping, and a trade in corn, wood, linen, hides, bark, and ashes. From 28th August to 21st November, 1645, a conference was held at Thorn of Polish and German divines, presided over by George Ossolinski, chancellor of Poland, under the auspices of Ladislaw IV., by whose orders the assembly was convened, for the purpose of reconciling the differences between Catholics and Protestants. The result of the conference, it is said, was to embitter these differences. Pop. (1880), 20,617; (1890), 27,007; (1900), 29,626.

THORN-APPLE. See STRAMONIUM.

THORN-BACK RAY. See RAY.

THORN-HEADED WORMS. See NEMATHELMIA.

THOROUGH-BASS. See MUSIC.

THOROUGHWORT. See BONESET.

THORWALDSEN, ALBERT BARTHOLOMEW (Bertel), a celebrated sculptor, was born 19th Nov. 1770. His father, an Iclander, was employed in the royal dockyard at Copenhagen in cutting figure-heads for vessels, and little Thorwaldsen's first employment was in helping his father. In his eleventh year he entered the Academy of Arts, where, however, it was six years before he attracted the attention of his teachers. After this he gained several medals, and in 1793, along with a medal, the privilege of studying three years abroad. He resolved to visit Rome, where he arrived in November, 1797. Canova and Carstens the painter were then residing at Rome, and their works made a deep impression on the mind of Thorwaldsen, directing him to the ideal beauty of ancient statuary. It was not until 1803 that he became at all widely known. He had finished a model of Jason, which had lain on his hands for some time without finding a purchaser, when by a lucky chance, just as the disappointed sculptor was on the point of returning home, the well-known and wealthy Thomas Hope called at Thorwaldsen's studio to see the Jason. He was captivated with the work, and arranged with Thorwaldsen to have it executed in marble, at a large price. The fortune of its designer was now made. Commissions flowed rapidly in upon him, new creations from his hand followed in quick succession, and his unsurpassed abilities as a sculptor became everywhere recognized. In 1819 he returned to Denmark, and his journey through Germany and his reception at Copenhagen bore very much the appearance of a triumph. His first works in this city were the busts of the king and queen. He was next employed by the commissioners for the rebuilding of the Fruekirke or Church of our Lady, to design the decorations for the same, which now form its main ornament. In 1820 he quitted Copenhagen and returned to Rome, visiting on his way Berlin, Dresden, Warsaw, and Vienna, and receiving numerous orders for works. He remained at Rome till 1838, when he undertook another journey to Copenhagen, being principally moved to this step by the contemplated establishment in that city of a museum of his works and art treasures. His return was a true national festival both for Copenhagen and the whole of Denmark. With the exception of a short visit to Rome the remainder of his life was spent in the Danish capital, and he both took a vivid interest in the establishment

of the Thorwaldsen Museum and enriched it by important contributions. His death took place suddenly on 24th March, 1844. The Thorwaldsen Museum was opened in 1846, and contains about 300 of the works of the great Danish sculptor. Thorwaldsen was eminently successful in his subjects chosen from Greek mythology, such as his Mars, Mercury, Venus, the Graces, Cupid and Psyche, Hector and Priam, the Dance of the Muses on Mount Helicon, &c. His religious works are no less successful, among which we may mention the colossal group of Christ and the Twelve Apostles, St. John Preaching in the Wilderness, and statues of the four great prophets. Other works that we may mention are statues of Galileo and Copernicus, the Triumphal Entry of Alexander into Babylon, the beautiful bass-reliefs of Day and Night, and the colossal lion near Lucerne, in memory of the Swiss guards who fell in defence of the Tuileries.

THOTH, an Egyptian deity identified by the Greeks with Hermes (Mercury). He was styled the thrice great, and the invention of letters, arts, and sciences was attributed to him. The name, meaning 'word,' is equivalent in significance to the Greek Logos, and Thoth is a mythical personification of the divine intelligence. He is represented with the head of an ibis or a dog. There were forty-two sacred books under his name, which were under the guardianship of the Egyptian priests.

THOU, JAQUES AUGUSTE DE (in Latin, *Thuanus*), an eminent magistrate and historian, born at Paris 8th October, 1553. He was designed for the church, but gave himself up by preference to the study of law. He was employed on various occasions by the court, and in 1584 he was made a master of requests. On the revolt of Paris, produced by the violence of the League, he adhered to Henry III., and after the assassination of the Duke of Guise, was principally instrumental in reconciling Henry with the King of Navarre. Henry IV. employed him in several important negotiations, and nominated him principal librarian to the king in 1593. In 1595 he succeeded his uncle as chief-justice, and immediately registered in anticipation of the edict of Nantes, which he assisted in preparing, the edict of St. Germain in favour of the Protestants. In the regency of Mary de' Medici he was appointed one of the directors-general of finance, and otherwise employed in nice and difficult matters, in which he rendered himself equally conspicuous by integrity and ability. These various occupations did not prevent him from an assiduous cultivation of literature. His greatest literary labour was the composition in Latin of a voluminous History of his own Times (*Historia sui Temporis*), of which the first part was made public in 1604. To the great discredit of Henry IV. this work was condemned, in submission to the influence of the Catholic leaders, who were nettled at the freedom with which the historian did justice to the Huguenots, and censured the popes, the clergy, and the house of Guise. The history when finished consisted of 138 books, comprising the events from 1545 to 1607. It is a work at once copious and exact, and remarkable for its impartiality. To this work he subjoined Commentaries, or Memoirs of his own Life, composed in the same spirit. He died in 1617. The most handsome and complete edition of the History of De Thou is that published in London in 1733, by Buckley, in seven vols. folio.

THOUROUT, a town of Belgium, in the province of West Flanders, 11 miles S.W. of Bruges. It has manufactures of linen, hats, leather, cordage, earthenware, salt, soap, tobacco, chicory, and glue; a dye-works, and oil, flour, and malt mills. Near it are the ruins of the old castle of Wynendael, the residence

of the Counts of Flanders. In the middle ages its trade was very extensive. Pop. (1897), 9680.

THOYRAS. See RAPIN DE THOYRAS.

THRACE (probably from *tracheia*, rugged), a name applied at an early period among the Greeks to all the northern region beyond Macedonia, whose boundaries were not distinctly known, and which was usually conceived of as being a wild, mountainous land. At a later period it included the country bounded north by the Danube, south by the Propontis (Sea of Marmora) and the Ægean, east by the Pontus Euxinus (Black Sea), and west by the river Strymon (Struma). It was divided into two parts by Mount Hæmus (the Balkan). By the Romans, although the name of Thrace was sometimes applied to the whole country, it was divided into two parts by the Hæmus, the northern of which was called *Mœsia* and the southern Thrace. The land was originally, before it was cultivated, in part wild, and inhabited by a fierce and warlike people, among whom were the Getæ; it was therefore represented as the residence of Boreas, and considered sacred to Ares (Mars). The Greeks early settled colonies there, and the country was not destitute of rich meadows and corn-lands; it abounded in mines, and the Thracian horses and riders rivalled those of Thessaly. The principal mountains of Thrace were the Hæmus (Balkan), Rhodope, and Pangæus. Among the rivers the largest and most celebrated was the Hebrus (now Maritza). The remarkable places were Abdera, the birthplace of Democritus and Protagoras; Sestos, on the Hellespont, celebrated in the story of Hero and Leander; and Byzantium, on the peninsula on which Constantinople now stands. It was formerly governed by several princes, then subject to Macedonia, and finally formed a Roman province. Orpheus, Linus, and Musæus, the mythological founders of Greek poetry, music, and philosophy, are represented as coming from Thrace, and some writers suppose the Greeks borrowed many of their religious ceremonies and notions from the Thracians.

THRASHING MACHINES, machines for the purpose of separating the grain from the straw. The flail with which corn is commonly thrashed by hand is one of the earliest instruments employed for this purpose. It consists of two round sticks loosely joined with strong thongs. The longer is used as a handle, and with the shorter the heads of the sheaves which are spread on the thrashing-floor are beaten. (See FLAIL.) In the east oxen were anciently employed for thrashing corn. This method is wasteful, being liable to bruise and injure the grain. The Egyptians and also the Romans used a machine, called a *tribulum* by the latter, consisting of a ponderous wooden board armed with sharp pieces of iron or flint beneath, which was drawn over the corn by a yoke of oxen, and served to separate the grain and cut the straw. The first modern thrashing machine was invented by Michael Menzies, Edinburgh, about 1732, and about 1776 a machine was invented by Andrew Meikle, of Houston Mill, near Haddington, which contains the principle of those used to this day. In Meikle's machine the grain is separated from the straw by means of a revolving cylinder or drum armed with beaters, which are bars of wood protected with iron parallel to the axis of the drum and projecting from its surface. The drum has a circular covering 2 or 3 inches distant from the circle described by the edges of the beaters. The sheaves of corn are spread out on a feeding-board with the ears in front, and being caught between two fluted revolving rollers of cast-iron in front of the drum are dragged in so as to expose the ears to the action of the beaters. The beaters strike the ears repeatedly before the straw is clear of the rollers, and

thus separate the grain very completely. The straw is then carried round a series of circular or polygonal rakes, by which it is thoroughly separated from the grain, which falls through wire-work into an apparatus prepared for sifting it. The improvements on Meikle's apparatus have consisted in increasing the number of beaters, and the rapidity of the rotatory motion of the drum on which they are placed, and in extending the appliances for shaking the straw and sifting the grain.

The essential features of Meikle's thrashing-machine have been retained in the extensively used machine of Messrs. Ransomes, Sims, and Head, of Ipswich, to which is attached a straw elevator for the purpose of facilitating the stacking of the straw. The drums contain each six beaters, made of triangular bars of wrought iron, twisted into a three-thread screw, which forms a beater alike on all sides. The work of beating the corn is so severe that the beaters get rapidly worn, but these beaters are so constructed that they can be turned as the surface wears, presenting a perfectly fresh surface, and are thus equal in durability to three or four sets of the common sort. The corn screen, which is self-cleaning, is formed of two cylinders of wire, the smaller revolving within the larger, upon a different axis. The distance between them is so adjusted that it is not equal throughout, so that if the grain is caught at the bottom of the screen where the opening is narrowest, it escapes at the top where it is widest. The rotatory straw shaker contains fifteen revolving drums, armed with self-cleaning curved teeth. While the straw is carried up by the drums the grain and short straw (cavings) is carried down by a contrary action to the caving riddle, from which the cavings are delivered behind the fore-wheels of the machine. The chaff and grain fall upon collecting-boards, and then passing over a fine screen or dresser get the small seeds removed. The chaff and grain now enter the first fan (the term *double-blast* is applied because there are two fans), which removes the chaff, the grain is then carried by an elevating apparatus up to the hummeller in the upper part of the machine, from which it passes to a sieve, then to the second fan, from this to the corn screen, and finally to the different shoots.

The power used for working thrashing machines is supplied in various ways. Water and steam are now generally preferred as the most economical. Portable machines are frequently preferred to fixed, as saving the labour of transporting material, but fixed machines are capable of greater extension, and are comparatively cheaper.

**THRASIMENE** (or **TRASIMENUS**), LAKE. See **PERUGIA**, LAGO DI.

**THREAD.** The filaments of fibrous substances spun out for weaving are in a general sense called threads, the specific name of such filaments being yarn. Thread in a specific sense consists of two or more filaments of yarn twisted together for greater strength; when the filaments do not exceed two this is frequently called doubling, and the manufacturers who prepare it are called doublers. Doubled yarn or thread is used in some species of weaving, especially in that called bobbin net, but its principal use is for sewing. When manufactured for this purpose it is specifically known as sewing thread. A large proportion of sewing thread is simply doubled yarn, and the processes of yarn doubling and of the manufacture of sewing thread are substantially the same, but thread for sewing purposes often requires to be stronger and firmer in texture than doubled yarn, and then three, four, and six strands of yarn of fineness proportioned to the thickness of the thread required are used to produce it. The manufacture of sewing thread in the United Kingdom both for

home use and export is very extensive. As a general rule the thread manufactured for home use is of a much superior quality to that made for export. The United States is a large market for thread of superior quality, but most of the other American as well as nearly all the eastern markets take a very inferior quality. The thread made for home use is thus commonly known as six-cord, and that for export as three-cord thread. What is called six-cord thread, however, is only six-cord in the lower numbers and four-cord in the higher or finer numbers, while three-cord thread is commonly three-cord in the lower numbers and two in the higher. The chief seat of the cotton thread manufacture in Scotland is Paisley, in England Manchester. Linen thread is manufactured largely in Ireland.

**THREAD-WORMS.** See **NEMATELMIA**.

**THREATENING.** By the common law of England to threaten or menace bodily hurt is a civil injury against the person, and pecuniary damages can be recovered for interruption of a man's business through fear of such threats. Any person accusing or threatening to accuse any other person of infamous or other crimes specified, with the view to extort gain from such person or from any other person, is guilty of felony, and liable to penal servitude for life or for any term not less than three years, and to imprisonment for any term not exceeding two years, and if a male under sixteen, with whipping at the discretion of the court. Similar provisions are made against sending or delivering any letter threatening any house, barn or building, ship, vessel, &c., or to wound or maim any cattle; sending or delivering any threatening letter demanding any property or valuable thing without probable or reasonable cause. Any person who shall maliciously send or deliver, knowing the contents, any letter threatening to kill or murder any person shall be liable to penal servitude for any term between ten or five years, or to imprisonment or whipping as above specified. By 34 and 35 Victoria, cap. xxxii. (1871), the following offences subject to imprisonment with or without hard labour for not more than three months. Threatening or intimidating any person in such a manner as would justify a justice of the peace in binding over the threatener to keep the peace, molesting or obstructing any person in manner defined, all or any of these with a view to coerce any person to do any of the following things:—If a master, to dismiss or cease to employ any workman; if a workman, to quit any employment or return any work before it is finished; if a master not to offer, or if a workman not to accept any employment or work; whether master or workman, to belong to or not to belong to any temporary or permanent association or combination, or to pay any fine or penalty imposed by any such association; if a master, to alter his mode of conducting his business or the number or description of persons employed by him.

These laws do not apply to Scotland, but by the common law of Scotland such offences are punishable arbitrarily. The sending of threatening letters may be criminal whether the letters are signed or anonymous.

**THREE RIVERS**, a town of Canada, in the province of Quebec, at the confluence of the rivers St. Maurice and St. Lawrence, 90 miles from Quebec. It has an extensive trade in timber, and important manufactures of ironware, the St. Maurice forges, about 3 miles distant from the town, having been always celebrated in Canada. Three Rivers is the residence of a Roman Catholic bishop, whose diocese bears the same name; and contains Roman Catholic cathedral, various other places of worship, schools, &c. It sends a member to the provincial Parlia-

ment. It is one of the oldest towns in the province, having been founded in 1618. Pop. (1901), 9981.

**THRESHER-SHARK.** See **SHARK**.

**THROAT, MALADIES OF THE.** Some of these maladies have already been treated, for which see the articles **CROUP**, **GOTTIE**, **QUINSY**. Laryngitis is properly an inflammation of the mucous membrane of the larynx; the same name is applied to inflammation of the sub-mucous cellular tissue, hence the distinction of mucous and sub-mucous laryngitis. Acute mucous laryngitis presents innumerable varieties from a simple catarrhal affection to the most intense inflammation, and requires more or less active antiphlogistic treatment. Chronic laryngitis frequently results from undue exposure to climatic influences. In persons predisposed to pulmonary consumption it is liable, if neglected, to develop into that complaint. Sub-mucous laryngitis is oedema of the throat. (See **OEDEMA**.) Pseudo-membranous laryngitis is croup. Diphtheria is the generic name given by Bretonneaux to a class of diseases, the distinctive character of which is the tendency to the formation of false membranes. This disease attacks the mucous membranes generally, but has most commonly its seat in the mucous membranes of the mouth, the gums, the pharynx and the respiratory organs. It is frequently communicated from the mouth to the throat. In Great Britain the name of diphtheria is limited to a contagious form of the disease characterized by blood poisoning, and distinguished from croup, which the French authorities define as diphtheria of the larynx. (See **CROUP** and **DIPHTHERIA**.) It is a formidable malady, and requires the most active treatment.

**THRONDHEIM.** See **TRONDHEIM**.

**THROSTLE.** See **THRUSH**.

**THRUSH**, a disease occurring especially in infants, but sometimes seen in old persons, and consisting of small white ulcers upon the tongue, gums, inside of the lips, and palate, resembling particles of curdled milk. There is general constitutional disturbance, and it usually lasts eight or ten days.

**THRUSH**, the name applied popularly to several Insectorial Birds. The typical birds known by this name are included in a large family (*Turdidae*) of the Dendrocinetae, which is divided into a great number of sub-families. Of the latter the True Thrushes (*Turdine*) include the more typical forms; and as a sub-family these birds are distinguished by the following characters—Bill of moderate length, stoutly made, and compressed; the upper mandible notched at its tip, and having its ridge curved; 'gape' or mouth-opening provided with bristles; nostrils at the base of the bill, their opening unprotected and exposed; wings rounded, with the first quill short, the third and fourth quills being the longest; tarsi long; toes long and strong, the outer larger than the inner toe, and united to the middle digit at its base. The thrushes are widely distributed. The Mistle-thrush (*Turdus viscivorus*), the largest of the British resident species, attains a length of 11 inches, and is coloured a reddish-brown on the upper parts and yellowish-white below, the under surface being prettily marked with jetty black spots, of triangular form on the throat and neck and round on the chest and belly. These birds begin to breed early in April, and the song, which is sweet and powerful, may be heard as early in the year as February. They are bold and wary in character, and may drive away and combat intruding neighbours of greater size. The Mistle-thrush is particularly fond of fruit, and is destructive accordingly in gardens. The Song-thrush (*Turdus musicus*) is equally well known with the former species as a familiar British bird. This bird is also known as the 'Throstle,' and its sweet song,

begun in early spring and continuing even to November or December, has deservedly made it the subject of attention both by naturalists and poets. The Throstle can imitate sounds to a certain extent, and has been known to reproduce with faithful accuracy the tunes of the flute. The colour is a brown of different shades on the upper parts, the chin being white, and the belly and under tail-coverts a grayish-white. The throat, breast, and inner aspect of the thighs are yellowish, spotted with dark brown. Its average length is 9 inches. The fecundity of these birds is very great, a single pair having been known to rear five broods, numbering seventeen birds in all, in the course of a single season. The eggs, numbering five, are blue, spotted with black. The food consists of fruits, worms, and especially of snails, these birds dexterously breaking the shells of these molluscs by hammering them against stones. The nest is large and basin-shaped, and composed of roots and mosses. The Thrush family also includes the familiar Black-birds, Field-fares, Red-wings, Ring-ouzels, and other familiar birds described in the various articles of these names.

**THUANUS.** See **THOU (DK)**.

**THUCYDIDES**, the greatest of all the Greek historians, was born in Attica of a good family, about B.C. 471. His father's name it is said was Olorus, his mother's Hegesipyle; but there is much uncertainty about the facts of his life. He possessed gold mines in Thrace opposite the island of Thasos, and was in consequence one of the richest and most influential men in Thrace. In B.C. 431 the Peloponnesian war, which forms the subject of the historian's great work, was begun. In 430 the plague broke out in Athens. Thucydides took it, and was one of the few who recovered. In B.C. 424 he commanded a squadron of seven ships at Thasos. The Spartan general Brasidas besieged Amphipolis, and Eucles, who commanded in that important post, sent to Thucydides for aid. Thucydides appears to have made all haste in preparing to answer the summons, and even to have used his private means to forward his equipment, but Brasidas, apprehensive of the approaching relief, offered favourable terms to Eucles, which were accepted, and Thucydides only arrived the day after the surrender. Yet he was in time to save Eion from falling into the hands of the enemies. Whether this transaction led to the banishment of Thucydides, or whether he exiled himself to escape death as its probable consequence, is not known; but from this time he became an exile, and the duration of his exile, according to his own account, was twenty years. Before the conclusion of this term the war terminated (B.C. 404), and all political exiles were permitted to return. Thucydides appears to have returned to Athens in the following year; and he is said to have met a violent death probably a year or two later, but at what exact time, and whether in Thrace or Athens, is not known. During his exile he must have remained close to the theatre of the war, of which he was a diligent observer, and as he could not remain in the Athenian dominion he may have passed this period of his life, or the greater part of it, within the domains of the Spartan alliance. It is also probable that he visited Sicily and Southern Italy. His history consists of eight books, the last of which differs from the others in containing none of the political speeches which form so striking a feature of the rest, and is also generally supposed to be inferior to them in style. Hence it has been thought by various critics to be the work of a different author, of Xenophon, of Theopompus, or of a daughter of Thucydides; but it is more probable that it is the author's own without his final revision. The history is incomplete, the eighth book stopping abruptly in



the middle of the twenty-first year of the war. As a historian Thucydides holds the foremost place. He was painstaking and indefatigable in collecting and sifting facts, brief and terse in narrating them. His style is full of dignity and replete with condensed meaning. It is, however, sometimes harsh and obscure from over-condensation. He is unsurpassed in the power of analysing character and action, of tracing events to their causes, of appreciating the motives of individual agents, and of combining in their just relations all the threads of the tangled web of history. It is to the superiority and impartiality of his judgment that he owed the power of producing a work which should be, as he himself said, a possession for posterity. Among the most valuable editions of Thucydides are those of J. Bekker (Berlin, 1821, three vols.), Poppo (Leipzig, 1821-38, ten vols.), Stahl (Leipzig, two vols., 1873-74), and Classen (Berlin, 4th ed., eight vols., 1897 onwards). There are English translations by the Rev. Thomas Dale and Prof. B. Jowett.

**THUGS**, the name applied to a secret and once widely-spread society among the Hindus, whose main occupation was to waylay, assassinate, and rob all who do not belong to their own caste. This they did, not so much from cupidity as from religious motive, such actions being deemed acceptable to their god-dess Kālī. The government first took active measures against them in 1831, and in 1835, 1262 persons were condemned as Thugs. They are now understood to be quite extinct.

**THULE**, the name given by the ancients to the most northern country with which they were acquainted. Probably the word did not always denote the same country or island; many, in fact, may not have attached to it the idea of any precise country. Hence the contradictory opinions of scholars respecting it. According to Pytheas it is an island six days' voyage to the north of Britannia, and accordingly it has often been identified with Iceland. Some have imagined it to be one of the Scotch islands, others the coast of Norway.

**THUN**, a town of Switzerland, in the canton of Bern, beautifully situated at the north-western extremity of the lake of its own name, at the point where the Aar issues from it. It contains a town-house, a military school, a gymnasium, a museum, orphanage, hospitals, &c., and is the chief place of arms in the confederation, especially for artillery. Pop. (1888), 5507.

**THUN**, a lake of Switzerland, in the centre of the canton of Bern, 10 miles long, 2 miles broad, and about 720 feet deep. At its south-eastern extremity it receives the surplus waters of the Lake of Brienz by the Aar, which again emerges from its north-western extremity. It furnishes some very fine scenery. There is a good deal of traffic on the lake, which is well stocked with fish. Steamers ply from Thun to Interlaken.

**THUNDER AND LIGHTNING.** See **LIGHTNING**.

**THUNDERING LEGION** (*Legio Fulminatrix*), a name given to a Roman legion in the time of the Emperor Aurelius. The following account of the name is given by the Christian traditions. After the expulsion of the Marcomanni and Quadi from Hungary, the Emperor Marcus Aurelius, pursuing these German tribes with a detachment of his forces (A.D. 174), was shut up in a valley surrounded on every side by high mountains. To those who were thus cut off from the main body of the army the heat and the want of water were no less dangerous than the attacks of the enemy. In this crisis a sudden shower of rain reanimated the Roman soldiers. At the same time a storm of hail, attended with thunder, assailed

the enemy, who were now easily repulsed and conquered. Both heathen and Christian authors agree in their relation of the principal circumstances of this event. The adherents of each religion saw in it the influence of the prayers of their brethren. According to Dio Cassius the miracle was wrought by an Egyptian sorcerer in the train of the emperor; according to Capitolinus it was the effect of the emperor's prayers; but according to Tertullian and Eusebius it was brought about by the prayers of the Christians in his army; hence the legion to which these Christians belonged was denominated *Fulminatrix*.

**THURGAU** (French, *Thurgovie*), a canton in the north-east of Switzerland, bounded mainly by the Lake of Constance and the cantons of Zürich and St. Gall; area, 381 square miles; capital, Frauenfeld. It differs much in physical conformation from most other Swiss cantons in having no high mountains, though the surface is sufficiently diversified. The whole canton belongs to the basin of the Rhine, to which its waters are conveyed chiefly by the Thur and its affluents, and partly also by the Lake of Constance, including the Untersee. The soil, which is usually of a clayey nature, is of very indifferent fertility. The principal crops are grain and potatoes. But the culture for which the canton seems best adapted is that of fruit; and accordingly large orchards are numerous. In many places also the vine is successfully cultivated. Wood is abundant. The manufactures consist chiefly of linen and hempen cloth, hosiery, ribbons, lace, muslin, buttons, and articles of cooperage. Trade, greatly facilitated by the Rhine and the Lake of Constance, is extensive. Nearly three-fourths of the inhabitants are Protestants, and education is generally diffused. The landgraviate of Thurgau, which belonged to the house of Hapsburg from 1264, was conquered by the Swiss in 1460. It was not erected into a separate canton till 1798. Pop. (1900), 113,110.

**THURIFER**, in the Roman Catholic Church, the bearer of incense, which is carried in a thurible, or incense vessel (from Latin *thus*, incense). He attends the priest at mass, vespers, and other solemn ceremonies.

**THÜRINGERWALD**, or **FOREST OF THURINGIA**, a mountain chain in the centre of Germany, commencing at the sources of the Werra and Schwarza, and stretching along the right bank of the Werra, south-east to north-west, as far as the mouth of the Horsel, near Eisenach, a distance of about 60 miles. In the south-east it is linked with the Frankenwald, and in the west with a ramification of the Rhön-gebirge. Its culminating points, situated to the west of Zelle, are the Grosser Beerberg and the Schneekopf, 3228 and 3201 feet high respectively. The mountains are composed chiefly of porphyry, granite, and clay-slate; and are well covered with wood, chiefly pine. The minerals include iron, copper, lead, cobalt, &c. The drainage is shared by tributaries of the Elbe, Main, and Weser.

**THURINGIA** (German, *Thüringen*), the name of a district of Germany, bounded on the west by the Werra, on the east by the Saale, on the north by the Harz mountains, and on the south by the Thüringerwald, and including numerous small constituent parts of the German Empire, besides portions of Prussia, Saxony, and Bavaria. It represents a former kingdom of a much greater extent, and was at different later times a duchy, a margravate, and a landgraviate. See **GERMANY**.

**THURLES**, a market-town in Ireland, in the county of Tipperary, on both banks of the Suir, the Great Southern and Western Railway running through the west part of the town. It has a Roman

Catholic cathedral, other churches, two convents, a monastery, a Roman Catholic college, a court-house, a new confraternity hall, &c. Pop. (1901), 4411.

**THURLOW, EDWARD, LORD**, Lord-chancellor of England, was born at Little Ashfield, near Stowmarket, Suffolk, in 1731. He received his early education from his father, a clergyman, and at the grammar-school of Canterbury. From thence he removed to Caius College, Cambridge. He gained no honours, and had to leave college in consequence of indecorous behaviour to the dean of his college. He subsequently entered the Middle Temple, and in 1754 was called to the bar. In 1761 he attained the rank of king's counsel, and soon had one of the best practices at the bar. He was employed to prepare the evidence for the appeal in the great Douglas cause. In 1765 he was returned as member of Parliament for Tamworth, and became a constant supporter of Lord North's administration. In 1770 he was made solicitor-general, and attorney-general in 1771. In 1778 he was appointed lord-chancellor, and raised to the peerage as Baron Thurlow. The personal favour of the king retained him in office during the Rockingham administration, whose measures he actively opposed. He was compelled to resign office on the dissolution of the ministry in 1783. He was still considered the confidential adviser of the king, and on the dissolution of the coalition ministry at the close of the year the great seal was restored to him by Pitt. He continued to hold office under Pitt when in 1788 the king's illness rendered it necessary to consider the contingency of a regency. Pitt suspected Thurlow of intriguing with the Prince of Wales. From this time an open disagreement took place between them, and Thurlow began publicly to oppose the measures of his colleagues, particularly Pitt's scheme for maintaining the sinking-fund, in the House of Lords. On this Pitt demanded his dismissal, to which the king at once agreed. He was deprived of the great seal on 15th June, 1792. He died at Brighton, 12th September, 1806.

**THURSDAY** (in Latin, *dies Jovis*, whence the French *Jeudi*), the fifth day of the week, so called from the old Teutonic god of thunder, Thor, the northern Jupiter. (See **THOR**.) The German name *Donnerstag* is of similar origin; and *Thor*, *Donner*, are equivalent to English *thunder*. Ascension-day is often called *Holy Thursday*.

**THURSO**, a police burgh, seaport, and market-town of Scotland, in Caithness, on Thurso Bay, on the left bank and at the mouth of the Thurso river, 18 miles N.W. of Wick. It has a parish church, United Free, and other churches, public and church schools, a town-hall, containing a free library, a museum, a hospital, &c. There are remains of a fourteenth-century church and an old bishop's palace. It has a safe harbour for small vessels, but larger ships have to discharge and load in Scrabster Roads. Caithness flagstones are exported in considerable quantity, and herring-fishing is carried on in its season. Pop. (1891), 3936; (1901), 3724.

**THYESTES**, in Greek mythology, son of Pelops and Hippodamia, and grandson of Tantalus. Having seduced the wife of his brother Atreus, the latter, in revenge, served up to him the body of his own son at a feast. Thyestes, discovering the fact, fled to Sicyon with his daughter Pelopia, by whom he had a son, Ægistheus. Pelopia afterwards married Atreus. An oracle had declared that the son and grandson of Thyestes should revenge the crime of Atreus; and when Ægistheus was grown up he accordingly murdered his uncle at the instigation of his father. Thyestes then ascended the vacant throne, but was afterwards expelled by Agamemnon and Menelaus,

the sons of Atreus, and died in banishment on the island of Cythera. There are various versions of these legends.

**THYME** (*Thymus vulgaris*), a small plant of the natural order Labiatae, a native of the south of Europe, and frequently cultivated in gardens. The stems are branching, 8 inches or a foot in height; the leaves simple and opposite; and the flowers disposed in whorls near the summits of the branches. All parts of the plant have a strong and penetrating odour. Its essential oil is extremely acrid and pungent, and is used for culinary purposes, but less so now than before the oriental spices were common. Bees are very fond of this plant, and the honey obtained is of superior quality. The thyme of Mount Hymettus is celebrated. The common thyme of our hills and uplands is the *Thymus serpyllum* of botanists.

**THYMELEACEÆ**, the Daphne family, an order of exogenous plants with apetalous or polypetalous flowers, anthers bursting lengthwise, a solitary suspended ovule, and an imbricated calyx. The stem is shrubby, seldom herbaceous, with tenacious bark. The leaves are alternate, opposite, entire, exstipulate. Flowers capitate or spiked, terminal or axillary; calyx inferior, tubular, coloured, 4, rarely 5 cleft; aestivation imbricate, corolla wanting, or some scale-like petals in the orifice of the calyx; stamens perigynous, definite, often 8, sometimes 4, more rarely 2, opposite the segments of the perianth. The fruit is nut-like or drupaceous. The chief genera are *Aquilaria*, *Phaleria*, *Gnidia*, *Struthiola*, *Daphnopus*, *Thymelæa*, *Daphne*, and *Pimela*. The order contains 37 genera and about 400 species. Some of the genera belong to the north temperate zone, but the plants are most numerous in South Africa and Australia. See **DAPHNE** and **LACE-BARK TREE**.

**THYMUS GLAND**, one of the ductless glands, existing as a temporary organ, developed to its full size about the end of the second year of life and decreasing in size after that period. At puberty (which see) the thymus gland almost or wholly disappears. At its full development this gland appears to consist of two lobes or halves, situated in the middle line, and placed partly in the neck, extending from the cartilage of the fourth rib upwards as high as the inferior edge or border of the thyroid gland (which see). It is covered in front by the breast-bone, and by the sterno-hyoid and sterno-thyroid muscles. It rests upon the pericardium or heart-sac, and lies on the neck on the front and sides of the windpipe. This gland is of a pink-gray colour, it exhibits a lobulated appearance, and is of soft consistence. The average length is 2 inches, the breadth 1½ inch, and the thickness from 3 to 4 lines. Its weight at birth is ½ oz. Its microscopic structure exhibits a composition of lobules, each lobule being formed of regularly disposed masses of what is termed lymphoid tissue, consisting of a mesh-work of exceedingly delicate connective tissue, the meshes being crowded with round cells identical with the white corpuscles of the blood and lymph corpuscles. The functions of this gland are still undetermined. It is placed in the same category as the thyroid gland and spleen; and the most probable theory as to its use is that which assigns to it the work of elaborating the elements of the blood, especially in the earlier years of life.

**THYROID GLAND**, a structure having no outlet or duct, and classified with the spleen, thymus gland, and supra-renal capsules under the general name of *ductless glands*. The thyroid gland is situated in man at the upper part of the windpipe, and consists of two halves or lobes, placed one on each side of the windpipe, and united by a narrow bridge of substance—the *isthmus* of the gland. It is covered in front by



the muscles of the neck, and its sides lie in contact with the common carotid artery. Its under surfaces embrace the windpipe and larynx. This gland is of a reddish colour. It is larger in women than in men, and weighs, on an average, about 1½ oz. It may become enormously enlarged, as in the well-known disease named *goitre*. Its structure consists of numerous small shut sacs, surrounded by a net-work of capillary blood-vessels. Each vesicle or shut sac is lined internally by a single layer of columnar cells, and is filled with a glairy mucoid substance. The blood-vessels of the gland are derived from the superior and inferior thyroid arteries, and its nerves come from the pneumogastric and sympathetic trunks. The use of this gland is not at all clear. Its business is connected with the maintenance of a proper quality of blood, either by the removal of certain effete substances from the blood, or by the addition of certain elements to it. Its complete extirpation or atrophy is attended with disease.

**THYRSUS**, among the Greeks, a wand or spear wreathed with ivy leaves, and with a pine-cone at the top, carried by the followers of Bacchus as a symbol of devotion. See **BACCHUS**.

**THYSANURA** ('Spring-tailed'), an order of lower insects, which are apterous or wingless, and ametabolic—that is, do not undergo any metamorphosis (which see). They are represented by such forms as the Poduræ or Spring-tails, the *Lepismæ* or Sugar-lice, &c. The former are found inhabiting damp cellars and similar situations, and the latter occur amongst sugar. The Poduræ have the extremity of the abdomen provided with a forked bristle-like appendage, by the bending and sudden straightening of which they are able to effect considerable leaps. The sugar-lice also possess caudal bristles. In the Thysanura the mouth is of the masticatory or biting type, and the bodies of these insects are covered with beautiful scales, which form delicate test objects for the microscope.

**TIARA**, originally, and with Herodotus, the cap of the Persian kings. The tiara of the pope is a high cap surrounded by three crowns rising one above the other. These crowns are covered with precious stones, and ornamented with an orb, on which stands a cross, and on two sides of it a chain of precious stones. Originally the popes wore a common bishop's mitre. Alexander III., in the twelfth century, is said to have surrounded the mitre with a crown as a sign of sovereignty. Boniface VIII. (who died in 1303) is said to have added the second as a sign of power over spiritual and temporal things; and Urban V. (who died in 1370) the third, in order, as is believed, to indicate the power of the pope in the church, suffering, militant, and triumphant (or in hell, on earth, and in heaven). As the mitre is placed over the coat of arms of bishops, and the cardinal's hat over that of the cardinals, so the tiara, with the two keys, is placed over the family coat of arms of the pope.

**TIBER** (Italian, *Tevere*; anciently, *Tiberis*), a river of Italy, which rises in the Apennines, in Tuscany, flows first south as a mountain torrent, then turning S.E. enters Perugia, flows south-east into the province and traverses the city of Rome, shortly after quitting which it flows south-west, and separating into two branches—the Fiumicino on the north and the Fiumara on the south, forms the island called *Insula Sacra*, and falls into the Tyrrhenian Sea by two mouths. Its whole course is about 240 miles, of which about 90 miles, commencing at the confluence of the Nera, are navigable, but only with considerable precaution. Its water, always surcharged with a yellowish mud, is unwholesome, and its fish also are said to be of very indifferent quality.

**TIBERIAS**. See **GENNESARET**.

**TIBERIUS** (**TIBERIUS CLAUDIUS NERO CÆSAR**), a Roman emperor, born B.C. 42, was the son of Tiberius Claudius, of the ancient Claudian family, and of Livia Drusilla, afterwards the wife of Augustus. Rapidly raised to authority by the influence of his mother, he displayed much ability in an expedition against some revolted Alpine tribes, in consequence of which he was raised to the consulate in his twenty-eighth year. On the death of Vipsanius Agrippa, the gravity and austerity of Tiberius having gained the confidence of Augustus, the Emperor chose him to supply the place of that minister, obliging him, at the same time, to divorce Vipsania and wed his daughter Julia, whose flagitious conduct at length so disgusted Tiberius that he retired, in a private capacity, to the Isle of Rhodes. The deaths of the two Cæsars, Caius and Lucius, induced the emperor to adopt him as his heir, and on the death of Augustus he succeeded (A.D. 14), without opposition, to the sovereignty of the empire. The new reign was disquieted by dangerous mutinies in the armies posted in Pannonia and on the Rhine, which were, however, suppressed by the exertions of the two princes, Germanicus and Drusus. The conduct of Tiberius as a ruler has formed a complete riddle for the student of history, uniting with an extreme jealousy of his own power the highest degree of affected respect for the privileges of the senate, and for the leading virtues of the ancient republican character. He also displayed great zeal for the due administration of justice, and was careful that, even in the provinces, the people should not be oppressed with imposts—a virtue which, according to Tacitus, he retained when he renounced every other. Tacitus records the events of this reign, including the suspicious death of Germanicus, the detestable administration of Sejanus, the poisoning by that minister of Drusus, the emperor's son, and all the extraordinary mixture of tyranny with occasional wisdom and good sense which distinguished the conduct of Tiberius, until his infamous and dissolute retirement (A.D. 27) to the Isle of Caprea, in the Bay of Naples, never to return to Rome. On the death of Livia, in the year 29, the only restraint upon his actions and those of the detestable Sejanus was removed, and the destruction of the widow and family of Germanicus followed. (See **AGRIPPINA**.) At length, aspiring to the throne, Sejanus fell a victim to his ambition in the year 31 (see **SEJANUS**); and many innocent persons shared in his destruction, in consequence of the suspicion and cruelty of Tiberius, which now exceeded all limits. The remainder of the reign of this tyrant is little more than a disgusting narrative of servility on the one hand and of despotic ferocity on the other. In the midst, however, of all this tyranny, he often exhibited gleams of strong sense and of a judicious attention to the public welfare—a remark which holds good in every part of his anomalous reign. At length, leaving his favourite island, the scene of the most disgusting debaucheries, he stopped at a country house near the promontory of Misenum, where, in March, 37, his death took place, being accelerated, according to Tacitus, by suffocation. In this reign was established the crime of *læsa majestas*, which, through the morbid suspicion of the emperor, caused the death of many citizens for their unguarded expressions of opinion.

**TIBET**, or **THIBET**, a country occupying the south portion of the great platform of Central Asia, lying between lon. 73° and 101° E., and lat. 27° and 36° N., and extending from the sources of the Indus to the frontiers of China, and from Hindustan to the Desert of Gobi, comprising a superficial area of about 400,000 square miles. Its plains average above 10,000 feet in height, and many of its mountains

have twice that altitude. The ranges are generally parallel to those of the Himalaya, but on the east run north and south. Within the boundaries of Tibet are the sources of nearly all the great rivers of the south and east of Asia, the Indus, Satlej, Brahmaputra, Irrawady, Mekon, Menam, Yang-tse-kiang, Hoang-ho, &c. Immense rocks and mountains, without any appearance of vegetation, alternate with dry and infertile plains. The wheat, pease, and barley, which grow on the latter, in many parts never ripen, and serve only as fodder for cattle when grass fails. At regular intervals rain occurs, and a short grass springs up, which stops growing as soon as the rain ceases, and is immediately so parched by the dryness of the atmosphere as to become entirely white, and can be reduced to powder by rubbing it between the fingers. Yet it affords pasture to large herds of cattle. The chief peculiarities in the climate of Tibet is the excessive dryness of the atmosphere and the severity of the winters. From October to March so little moisture exists in the air, that vegetation is almost wholly dried up; meat and fish may be preserved fresh for all that time; and the cold is excessively intense. But notwithstanding the inclemency of the climate there is a great abundance of wild and domestic animals. Among the most remarkable of these is the yak, which exists both in a wild and a domesticated state. It constitutes the wealth of the wandering Tartars, who procure from it food and clothing, and make use of it as a beast of burden. The musk-deer, the Cashmere goat, wild horses, and the fat-tailed sheep are also among the animals of Tibet. In suitable localities agriculture is successfully practised, and grapes and other fruits are grown. The mineral productions include gold, cinnabar, lead, copper, iron, borax, and rock-salt. Tibet is a country of extensive traffic, the principal trade being with China; this is conducted at Lassa, the capital of Tibet, and at Si-ning, a city of the Chinese province Kansoo, from which place large caravans go at stated periods to Lassa, carrying tea, silk goods, and other Chinese produce, which are exchanged for gold-dust, woollens, incense, Buddhist idols, and Indian and European goods. The religion of the country is that form of Buddhism known as Lamaism (which see), of which Thibet is the principal seat, being regarded by the votaries of that faith as a sacred land; it is consequently largely resorted to by pilgrims, from whose offerings the lamas or priests derive valuable revenues. These lamas form a large proportion of the population, and live in monasteries, many of which accommodate from 3000 to 4000 persons. They are presided over by the Grand or Dalai Lama, who resides in the Buddha La, a vast palace near Lassa, and is regarded as the sole religious and political head of the state. The manners and mode of life of the inhabitants are rude: the houses of the peasants are merely piles of stone, with holes to let in air and light. At Lassa and elsewhere there are some magnificent temples. The language is allied to the Chinese. A rude mode of printing, with immovable letters, has been introduced from China: the characters used are derived from the Sanskrit. The history of Thibet is of little interest. It continued to be governed by its own princes till the commencement of the 18th century. Some internal troubles having occurred in 1720, the Chinese seized the opportunity to obtain an ascendancy in the country, which, since that time, has been on the increase. A Chinese functionary is always stationed at the residence of the Grand Lama, who transmits information to, and receives instructions from Pekin. There is also a Chinese governor with a military force stationed in each of the principal towns. Pop. estimated at 6,000,000.

**TIBULLUS, ALBIUS**, a Roman poet, who belonged to the equestrian order, and died in the flower of his age, about B.C. 18. He was on intimate terms with Messala, and in 81 accompanied him in a campaign in Gaul. He set out with him to the East also, but was forced to return through ill-health. Henceforth he lived on his estate, between Tibur and Praeneste. Horace was warmly attached to him, and addresses to him one of his epistles. We possess four books of elegies under his name, but the third and part of the fourth are spurious. These poems are among the most perfect of their kind which have come down to us from classical antiquity. Their moral tone, however, is that of a reckless voluptuary. The elegies of Tibullus are superior to those of Propertius (with which, and the poems of Catullus, they are usually printed) in agreeable simplicity and tender feeling, and are free from the insipid prate into which Ovid frequently falls; so that the author deserves the first place among the Roman elegiac poets. A common opinion now is that the four books contain poems by other members of a poetical coterie. The chief editions are those of Lachmann (1829), L. Müller (1870), Bährens (1878), and Hiller (1885); also in Postgate's *Corpus Poetarum Latinorum*. There is a translation by Cranston (1872).

**TIC DOULOUREUX**, a painful affection of a facial nerve, a species of neuralgia. It is characterized by acute pain, attended with convulsive twitchings of the muscles, and continuing from a few minutes to several hours. Quinine in full doses is the usual remedy.

**TICINO** (German and French, *Tessin*), a river of Switzerland and North Italy, which rises on the southern slope of Mount St. Gothard, on the frontiers of the canton to which it gives its name; flows first south-east till it approaches Bellinzona, when it changes its direction to south-west, traverses Lake Maggiore, proceeds s.s.e., forming the boundary between Piedmont and Lombardy, and shortly after, passing Pavia, joins the Po on the left; total course, exclusive of the lake, about 120 miles.

**TICINO** (German and French, *Tessin*), a canton in the south of Switzerland, between Uri, Grisons, Lombardy, Piedmont, and Valais; area, 1095 square miles. This canton, in respect of climate and general physical features, is divided into two very unequal parts by Mount Ceneri, which stretches across it from east to west towards the head of Lake Maggiore. The north and far larger part is an elevated and mountainous region, its northern frontier being formed by several of the loftiest of the Alps, the Splügen, St. Bernardin, and Mount St. Gothard. The smaller part of the canton lying on the south side of Mount Ceneri exhibits in its scenery, climate, and productions the characteristic features of Italy. The whole canton, with exception of a very minute portion of the south, which sends its water to Lake Como, is drained by Lake Maggiore, and belongs through it to the basin of the Po. The principal stream by which the drainage is performed is the Ticino, which gives its name to the canton, and is augmented within it by several affluents. Besides these streams there are numerous lakes. The most important of all, Lake Maggiore, has only a small part of its area within the canton. The northern part of the canton, from its ruggedness, is suited only to the rearing of cattle and the preparation of dairy produce. In the southern part are grown the olive, the vine, and many of the more delicate Italian fruits—figs and almonds, oranges, citrons, and pomegranates. Manufactures and trade are unimportant. Ticino was not formally admitted to the Swiss Confederation till 1815. The inhabitants belong to the Italian type. Bellinzona, Locarno, and Lugano are each in turn the seat of government.

Pop. (1900), 142,719, almost entirely Roman Catholics in religion.

**TICKET-OF-LEAVE**, a certificate given to a convict by which he is permitted to go at liberty before the expiration of his sentence, upon good behaviour, though on condition of reporting himself periodically. A period of remission according to the conduct of the prisoner is now systematic.

**TICKING**, a strong cloth, commonly made of twilled linen or cotton and of a striped pattern. It is chiefly used for covering mattresses for beds.

**TICKNOR**, GEORGE, an American historian, was born at Boston, 1st August, 1791. He graduated at Dartmouth College in 1807, and for the three following years devoted himself to the study of the ancient classics. He was admitted to the bar in 1813, but he never adopted the law as an active profession. In 1815 he embarked for Europe, and during a five years' residence visited Göttingen, Rome, Madrid, Paris, Edinburgh, and London, for the purpose of pursuing his studies. On his return he was appointed to the Smith professorship of Modern Languages and Literature in Harvard University. In 1835 he resigned his professorship, and for the next three years travelled in Europe with his family. On his return he devoted himself to the preparation of a History of Spanish Literature, which was published in New York in 1849, in three vols. 8vo, a corrected and enlarged edition being published in 1863. It was at once recognized by scholars as a work of value, and has been translated into Spanish and German. After some works of minor interest he produced in 1863 a Memoir of Prescott, the historian, with whom he had maintained a close friendship. He died 26th January, 1871.

**TICKS**. See *IXODS*.

**TIDE-MILL** is a kind of water-mill turned by the action of the tide. There are two distinct modes of applying this kind of power: the one is by filling a reservoir at flood-tide, which is made to turn a wheel in escaping. The common period of working of this species of mill is about four hours in each ebb. The other method is to place a horizontal wheel in the river to be turned by the current either in ebb or flow. The motion of this mill is not continuous, being suspended at the turn of the tide. It attains its maximum motion at half-tide, and where uniformity of motion is required regulative machinery is necessary.

**TIDES**, the rising and falling of the water of oceans, which occurs periodically, as observed at places on the coasts. It is evident, from the periodical return of high water at intervals corresponding to positions of the moon and sun relatively to the place at which observations are taken, that the phenomena of tides are due to the attractive influences of the moon and sun. The explanation given by Newton was as follows:—The moon attracts every particle of the earth; the liquid particles of water are free to move, and those nearest the moon will be most strongly attracted; the whole solid part of the earth will be attracted with a force due to the distance between its centre of gravity and the centre of gravity of the moon; if the earth were all water the action of the moon would tend to make it an ellipsoid, of which the major axis would point to the moon; if the solid portion were all submerged beneath a superficial layer of water the surface would take the form of an ellipsoid, and the solid portion would be nearly in the centre of the ellipsoid. Thus we should have high water at a place when the moon is in the meridian, and high water again in 12 hours 24 minutes when the moon has described 180°. The attraction of the sun would cause a similar arrangement of the water, but in a less degree; and when

the major axes of the two ellipsoids coincide, as at new and full moon, we should have *spring* tides, and when they intersect at right angles, as at the moon's quadrature, we should have *neap* tides. The interference of coasts and irregularities in the ocean beds cause the great variation as to time and range in the actual tides observed at different places. Coming back to our supposition of a uniform stratum of water it is easy conceiving the point of highest water keeping in the line joining the centre of the moon with the centre of the earth, and we get the idea of a wave whose crest at the equator moves at about 1000 miles an hour. This is a motion not of translation but of mere elevation and depression, which has been compared to the motion of heads of corn in a corn-field when swept by a breeze. It is easy to see, however, how the mere elevation and depression of the particles of an ocean, say to the west of a point, may necessitate a rushing motion of translation in the bays and estuaries of a coast to the east of the point. The motion of high water from one part of an ocean to another is called a *tidal wave*. It is conceivable that all the peculiarities of tide at different places may be explained when we are able to see the action of each modifying portion of coast or deep part of ocean, and in some cases there is no difficulty in perceiving how certain peculiarities arise. In the Bay of Fundy the tide rises 50 feet, and at places along the west coast of England from 30 to 40 feet; and this is due to a rush of translation at a coast being produced by a motion of elevation or depression in an ocean and the mass of rushing water being cornered in narrow channels. In some places, as in the German Ocean at a point north of the Straits of Dover, a high tide meets low water, and thus maintains perpetual mean tide. In the case cited high water transmitted through the Straits of Dover encounters low water transmitted round the north of Scotland, and *vice versa*. The interval of time at any place between noon and the time of high water on the day of full or new moon is called the *establishment of the port*.

**TIE-BEAM**. See *ARCHITECTURE*.

**TIECK**, LUDWIG, a celebrated German writer, whose influence on the literature of his country has been of a very marked nature, was born at Berlin on the 31st of May, 1773. In 1782 he entered the Werder Gymnasium, and in 1792 he proceeded to the University of Halle, where, as afterwards at Göttingen and Erlangen, he devoted himself enthusiastically to the study of history and of ancient and modern literature. Shakspeare more especially attracted his attention. In 1794 he returned to Berlin, where he, along with his sister Sophie, on the invitation of Nicolai, now contributed a series of tales to the *Straussfedern* (Ostrich Feathers), a work commenced by Musaeus and J. G. Müller. He also published separately his tale of Abdallah, and a novel entitled William Lovell (three vols. Berlin, 1795). His Peter Lebrecht eine Geschichte ohne Abenteuerlichkeiten and Peter Lebrecht's Volksmärchen were alike charming for their imaginative power and simplicity, and their rich overflowing humour. In the works that immediately followed these (Blaubart, der gestiefelte Kater, &c.) Tieck made the classical school the object of his satire. Some of his subsequent works, especially Franz Sternbald's Wanderungen (1798) and Phantasien über die Kunst (1799), indicating a tendency to Catholicism, brought about a dryness between him and Nicolai, but a close friendship was cemented with Schlegel, whose acquaintance he had made at Berlin in 1796, and through this association arose what has been denominated 'The Romantic School of Germany.' In 1799 he removed to Jena, where he gained the friendship of Novalis, and contracted also

a closer intimacy with Steffens. About this time he published *Romantische Dichtungen* (two vols., Jena, 1799–1800). A translation of *Don Quixote* (four vols., Berlin, 1799–1801) far surpassed all former renderings of Cervantes into German. In 1802 he issued, along with A. W. von Schlegel, the *Musen-almanach*, which encountered much opposition, and found also many admirers among susceptible youth. His long-expected *Kaiser Octavianus*, which contains many beautiful passages, and is the best of his romantic productions, appeared in 1804. In 1805 he went to Italy with the view of re-establishing his health, which had suffered severely from attacks of gout. Having returned to Germany in the autumn of 1806, he took up his abode first at Ziebingen, in the vicinity of Frankfurt-on-the-Oder, from which he removed successively to Dresden and Vienna, and at last settled at Munich, where new and severe attacks of illness detained him till 1810. Partially convalescent, he then returned to Ziebingen, where he formed an intimacy with Solger, which exercised a great and beneficial influence on his future life. Tieck now freed himself from the mysticism and extravagance of fancy which were blots on almost all his earlier works. His *Phantasus* (three vols., Berlin, 1812–15) gave the first sign of his having attained to a healthier tone. In 1817 he made a journey to England, where he collected materials for his *Shakspere*. He returned by way of Paris, and resided at Ziebingen till 1819, when he removed to Dresden. Subsequent to this period the writings of Tieck, as exemplified in his *Tales*, bear the unmistakable stamp of genius. These tales appeared in various forms, partly in annuals, partly in the *Novellenkrans* (Garland of Fiction), and were ultimately published in twelve volumes (Berlin, 1853). While in Dresden he took a lively interest in the management of the court theatre, a circumstance to which are attributable his valuable *Dramaturgische Blätter* (two vols., Breslau, 1826). As already mentioned he was an ardent student of *Shakspere*. The result of these studies were two volumes entitled *Das Altenglische Theater* (Berlin, 1811), consisting of translations of the plays sometimes attributed to *Shakspere*, although not generally included in his works; two volumes entitled *Shakspere's Vorschule* (Leipzig, 1823–29); but above all, the continuation of the German translation of *Shakspere*, which had been commenced by Schlegel. In this work he was assisted by his talented daughter Dorothea, and Count Wolf of Baudissin. On the accession of Frederick William IV. he was invited to the Prussian court, invested with a considerable pension and the rank of a privy-councillor, and thenceforward, though in very indifferent health, resided alternately in Berlin and Potsdam, and acted as a sort of supervisor of the Prussian stage. He died at Berlin on the 28th of April, 1853. Tieck's brother Christian Friedrich, born in 1776, died in 1851, was celebrated as a sculptor. See *Carlyle's Essays*.

**TIEL**, a town in Holland, in the province of Gelderland, 19 miles w.s.w. of Arnhem, on the right bank of the Waal. It carries on a considerable trade in fruit, more especially cherries, in fowls, grain, and potatoes. Pop. 10,000.

**TIENTSIN**, a town in the north of China, which may be considered the river-port of the Chinese capital, with which it has water communication by the Peiho River, a distance of about 120 miles by its windings, and 80 miles by land. A railway now also connects Tientsin with Peking and Ta-ku at the mouth of the river, and another line runs to Newchwang in Manchuria. Foreign vessels of ordinary burden cannot reach the city of Tientsin on account of a bar at the entrance to the river and its crooked

navigation. Hence large ships anchor outside in the Ta-ku roadstead. The river is frozen up from four to five months in the year, from October until February or March. A large import trade is carried on, chiefly in European merchandises. The principal imports are cottons, ironmongery, sugar, opium, &c.; the principal exports wool, cotton, and camels' hair. There is a large foreign 'concession' about 2 miles below Tientsin, and here there is an important body of European residents. Tientsin figured prominently in the events of 1900, for which see *CHINA*. Pop. variously estimated at from 200,000 to 900,000.

**TIERRA (or TERRA) DEL FUEGO** ('Land of Fire') is a large archipelago at the southern extremity of South America, separated from the mainland by the Strait of Magellan. It consists of one large island—Tierra del Fuego, Fuegia, or King Charles South Land—measuring east to west 500 miles, with a breadth north to south of 300 miles; and of numerous smaller islands. Of these latter the most important are the following: Navarin, Hoste, Gordon, Londonderry, and Stewart, south and south-west of the main island, from which they are separated by the Beagle Channel; Dawson, Clarence, Santa Inez, and Desolation, bounding the western part of the Strait of Magellan on the south; Wollaston, Hermite, Lennox, New, and Staten, more outlying islands, the last being the most easterly of the group, while Horn Island, a mere speck of land, with the famous cape of same name, is the most southerly. The total area is estimated at about 32,000 square miles (the same as Ireland). Staten Island and the part of the main island east of the meridian of 68° 34' belong to the Argentine Republic, the rest to Chili. The whole of the islands are penetrated deeply by arms of the sea, which give them the most irregular shapes; and, except on the eastern side of the large island, they are almost entirely composed of mountains forming a continuation of the Andes, and reaching the height of about 7000 feet. These mountains are clothed with forests, chiefly of evergreen beech, to the height of 1000 feet to 1500 feet, their tops being snow-clad. There is much magnificent scenery. Fauna and flora are both rather poor. The climate is disagreeable—mist, rain, and snow, accompanied with storms, being extremely common. Sheep-rearing is the chief industry, and large sheep farms on the modern system are common. Three linguistic and racial groups are now recognized among the inhabitants. The Ona, in the east of the main island, are a well-made race, speaking a language akin to that of the Patagonian Tehuelches, but the Yahgans of the extreme south and the Alakulufs of the west speak languages of a totally distinct character. The two latter races are of a somewhat stunted and degraded type. Missionaries have been settled amongst them for many years. Tierra-del-Fuego was discovered by Magalhães in 1520, and named 'Land of Fire' from the numerous fires he saw on its coast during the night. Pop. about 3000.

**TIERS-ÉTAT** ('third estate'), the name given in the ancient French monarchy to the third order of the nation, which, together with the nobility and clergy, formed the *états généraux* or states-general (which see).

**TIFLIS**. See *TEFLIS*.

**TIGER** (*Felis tigris*), a well-known species of digitigrade carnivorous Mammalia, belonging to the family Felidae, and possessing, in common with the lion, leopard, &c., five toes on the front feet and four on the hinder feet, all the toes being furnished with strong retractile claws. The appearance of this magnificent animal, of which only one distinct species (numbering a few varieties) is known, is sufficiently

familiar to all readers. The ground colour of the body is a bright tawny yellow, bearing black stripes running at right angles with the general axis of the body and limbs. The under parts and inner aspect of the limbs are white, as also are the throat and chest. On these white parts the stripes are lighter, and gradually merge into the white colour. The tail is not tufted at its extremity, is usually of lighter hue than the body, with dark rings. White or albino varieties of the tiger have been found, as also black ones. The maximum length, including the tail, is about 12 feet. The tiger attains its full development in India, the Bengal variety being the largest and most typical; but it also occurs in Southern Siberia, Turkestan, Persia, Java, Sumatra, &c. In habits these animals are far more active and agile than the lion, and exhibit a large amount of fierce cunning. They generally select the neighbourhood of water-courses as their habitat, and spring upon the animals that approach to drink. The march of the animal through the thick brushwood of the jungles in which he lives is noiseless and stealthy, and it appears rather to avoid than to court danger, although, when brought to bay, no animal presents a fiercer front than the tiger. Where deer, antelopes, and wild hogs are abundant, domestic animals are comparatively safe, though otherwise the tiger is ready enough to prey on the latter. Tigers appear to crawl slowly and stealthily after their prey in certain circumstances, this practice being especially noted in the case of 'man-eaters', as tigers, usually old ones, who have acquired a taste for human blood are called. These formidable enemies of man are captured in various ways, as by traps of several kinds, by spearing from boats, and especially by shooting from the backs of elephants or on foot. The Indian government encourages the extermination of the tiger by offering rewards. The number of persons killed by tigers each year in India averages about 930, mostly in Bengal, Madras, Central Provinces, Assam, and Burma. About 32,000 head of cattle are also killed annually in India by tigers. See CARNIVOROUS ANIMALS, Pl. I.

**TIGER-BEETLE** (*Cicindela campestris*), a species of beetles belonging to the family Cicindelidæ, which in turn belongs to the pentamerous section of the order Coleoptera. The head is wider than the thorax, and the terminal hook of the maxillary jaws is jointed at its base. This insect is swift and active, and preys upon other insects. *C. octonotata*, or the Eight-spotted Tiger-beetle of India, is another familiar species. See Pl. I. at ENTOMOLOGY.

**TIGER-FLOWER** (*Tigridiu pavonia*), a Mexican plant of the natural order Iridaceæ, frequently cultivated in gardens on account of the magnificence of its flowers. It springs from a scaly bulb. The leaves are radical, sword-shaped, and tapering towards the point of insertion; the stem is about 1 foot in height, slightly zigzag, dividing into two or three branches, and bearing a few alternate, distant leaves. The flowers are solitary, terminal, very large, of a singular form, and very evanescent. The three exterior divisions of the corolla are much the largest; of a fine orange-red towards the extremity; whitish or yellowish and beautifully spotted at the base. It is tolerably hardy, and is propagated by seeds or offsets.

**TIGER-MOTH** (*Arctia caya*), a genus of Lepidopterous insects, the caterpillars of which are well known under the popular name of 'woolly bears'. The moth is coloured red and brown. The larvæ feed on dead-nettles. The proboscis is small, and the wings are bent downwards in repose. See Pl. III. at ENTOMOLOGY.

**TIGRIS**, a river in Western Asia, rising by two

head-streams, the eastern one having its source near Bitlis, near Lake Van, and the western one originating near Kharpüt. Under the name of Dijleh or Shatt the western branch flows first south-east, then east, and having passed Diarbekir and received the waters of the eastern head-stream, it continues in a south-easterly or south-south-easterly course past Mosul and Bagdad and roughly parallel to the Euphrates, with which it unites at Kurna to form the Shat-el-Arab. At Bagdad the Tigris and Euphrates approach within 30 miles of each other, and hold a parallel course for about 80 miles, when they diverge, and keep apart from 80 to 100 miles, till they unite at Kurna. Generally speaking there is now little cultivation in the region through which the Tigris flows. The Tigris is navigable for rafts, at certain seasons, from Diarbekir to Mosul, a distance of about 300 miles. Below the latter place it is more or less so throughout the year, and the descent to Bagdad is performed with great ease and speed. Large rafts (keleks), supported by 200 or even 300 inflated skins, are much in use for the transport of goods. During the flood season the voyage is performed in three or four days, whereas at another time it requires fourteen days. The total course of the river is about 1150 miles. Its chief tributaries are the Greater and the Lesser Zab and the Diyala, all on the left. In the Bible this river is called Hiddekel.

**TILBURG**, a town in Holland, in the province of North Brabant, 13 miles east by south of Breda. It has manufactures of cloth and other woollen fabrics, calico-printing, tanneries, soap-works, breweries, &c. Pop. (1900), 41,518.

**TILBURY FORT**, a fort in England, in the county of Essex, on the north of the estuary of the Thames, opposite to Gravesend. It was converted into a regular fortification in 1667, and has since received important additions, which make it very formidable, particularly toward the river. Near this place the English army was reviewed by Queen Elizabeth in 1588 when the country was threatened by the Spanish Armada. Large deep-water docks, belonging to the London system, are now here, and are connected with several railways.

**TILES**. The term tiles is applied to a variety of articles made either for ornament, such as inlaid paving-tiles (see ENCAUSTIC TILES and MOSAIC), or for use, as in tile-draining (see DRAINING) and roofing. Tiles are made of a purer and stronger, more adhesive clay than bricks. In making them the first process is to *weather* the clay, which consists in laying it out on the ground in layers of 2 inches thickness and exposing it to the effect of frost or sunshine. It is then allowed to mellow or ripen in pits under water, and afterwards well kneaded in a pug-mill. The next process is to divide it into slices so as to allow of the stones falling out or being seen and picked out by the hand. The clay is then cut into slabs of the proper size to make tiles; and the tiles are moulded, dried, and finally fired. Fire-clay is now largely used for making roofing-tiles, and the tiles made of this material, although thinner, are stronger and more durable than others.

**TILIACEÆ**, the Lime-tree family, a natural order of plants, almost all the members of which are trees or shrubs, a small number only being herbaceous. They bear alternate simple leaves, accompanied at their base by two caducous stipules. Their flowers are axillar, pedunculate, solitary, or variously grouped. They have a simple calyx formed of four or five sepals placed close together in the form of valves previous to the expansion of the flower; and a corolla having the same number of petals, which are rarely wanting, and are often glandular at their

base. The stamens are numerous, free, with bilocular anthers. A pedicellate gland is often seen on the face of each petal. The ovary has from two to ten cells, containing each several ovules attached in two rows to the inner angle. The style is simple, terminated by a lobed stigma. The fruit is a capsule, with several cells containing several seeds, or through abortion a monoepermous drupe. The seeds contain a straight or slightly curved embryo in a fleshy endosperm. The Tillaceæ are allied to the Malvaceæ, from which they differ in having the stamens free and the embryo placed at the centre of a fleshy endosperm; and to the Byttneriaceæ, from which they are distinguished by their stamens being free and numerous, their style simple, and by other marks. Like the orders to which they are allied the Tillaceæ are mucilaginous. The jute-plant (*Corchorus capsularis*) is a member of this order.

**TILLANDSIA**, a genus of epiphytes, belonging to the natural order Bromeliaceæ. They are natives of tropical America. Some species are cultivated in hot-houses on account of the singular variety and splendour of the colours of their spathe and their flower-spikes. The species principally so cultivated are the *Tillandsia amana*, with large bracts of violet or rose colour, and spikes of green flowers with spots of blue at the top of the divisions of the segments of the petals; and the *Tillandsia splendens*, with a long spike formed of bracts of the most beautiful scarlet. The genus derives its name from the Swedish botanist Tillands.

**TILLEMONT**, LOUIS SEBASTIAN LE NAIN DE, an eminent historian, born at Paris in 1637, was the son of a master of requests, and received his education at the Port Royal. He assumed the name of Tillemont on entering the priesthood, devoted himself to study, and by his extraordinary industry and accuracy of research gained a high reputation as a historical writer. He was an intimate friend of Arnauld's. His death took place in 1698. He was the author of *Mémoires pour servir à l'Histoire Ecclésiastique des six premiers Siècles* (sixteen vols. 4to, 1693-1712) and *Histoire des Empereurs et des autres Princes qui ont régné durant les six premiers Siècles de l'Eglise* (six vols. 4to, 1690-1738).

**TILLER**. See HELM.

**TILICOLTRY**, a manufacturing town and police burgh of Scotland, in the county of Clackmannan, at the foot of the Ochil Hills, 9 miles north-east of Stirling. It has an Established church, and other churches; also a large school. The town carries on the manufacture of woollens, besides spinning and dyeing. The principal productions are tweeds, fancy worsteds, flannels, plaids, clan tartans, and shirtings. There are large coal-fields in the neighbourhood. Pop. (1891), 3939; (1901), 3337.

**TILLOTSON**, JOHN, an English prelate, son of a clothier, near Halifax, was born in 1630. His father, a strict Calvinist, brought up his son in the same principles. In 1647 Tillotson became a pensioner of Clare Hall, Cambridge, of which he was elected a fellow in 1651. It is not known when he entered into orders, but his first sermon which appeared in print is dated 1661, at which time he was still among the Presbyterians. When the act of uniformity passed in the following year he submitted to it, and, becoming celebrated for his pulpit oratory, was chosen preacher to the society of Lincoln's Inn, and lecturer at St. Lawrence, Jewry, in 1664. In 1666 he took the degree of D.D., and was made king's chaplain, and presented to a prebend of Canterbury. When Charles II., in 1672, issued a declaration for liberty of conscience, for the purpose of favouring the Roman Catholics, he preached strongly against it, but was, nevertheless, advanced to the

deanery of Canterbury, and three years after (1675) presented to a prebend in St. Paul's. On the accomplishment of the Revolution he was taken into favour by King William, and in 1689 he was appointed clerk of the closet to that sovereign, and in the same year was appointed Dean of St. Paul's. On the refusal of Archbishop Sancroft to take the oaths to the new government he was appointed to exercise the archiepiscopal jurisdiction during the suspension of that prelate; and in 1691, after exhibiting the greatest reluctance, he was induced to accept the archbishopric itself. He had previously formed a scheme for the comprehension of the Presbyterians within the pale of the church, which had been rejected by the convocation. He had also failed in another design for forming a new book of homilies; and in a sermon which he preached before the queen, had contended against the doctrine of eternal punishment. All these circumstances rendered him obnoxious to the advocates of orthodoxy. When, therefore, he accepted the primacy, a large party assailed him with great animosity; and he was reproached with the inconsistency of his own conduct with the doctrine he had advanced to Lord William Russell. He bore these attacks in silence, and even prevented some prosecutions for libel against him, directed by the crown. He was also charged with Socinianism; in answer to which he republished four of his sermons on the Incarnation and Divinity of our Saviour. There appears to have been no other ground for that imputation than that he defended Christianity on rational grounds, and corresponded with such men as Limborch, Locke, and Le Clerc; to which reason Dr. Jortin adds, that he had broken an ancient and fundamental rule of controversial theology—'Allow not an adversary either to have common sense or common honesty.' The only class to whom he did not show a mild and tolerant spirit was the Roman Catholics, towards whom he had a strong aversion. After his elevation to the see of Canterbury he exerted himself to advance the respectability of the church, and, among other things, wished to correct the evils arising from non-residence. He was, however, counteracted in all his endeavours by the most perverse opposition, which rendered his high station a scene of much more disgust than gratification, and soon after died of a paralytic stroke in 1694. Tillotson's sermons were for half a century the most popular of that class of compositions in the English language, but have since fallen into neglect and even disesteem. They are generally praised for their clearness and ease of style, but are now often found fault with for their diffuseness and languor. In other respects than that of style they are generally commended for benignity of spirit rather than depth or richness of thought. They have often been published.

**TILLY**, JOHANN THERKLAES, COUNT OF, one of the most celebrated generals of the seventeenth century, was born about 1559 in Walloon Brabant, at the castle of Tilly, a little to the north of Liège. After being educated by Jesuits strictly and fanatically, he entered the Spanish, the Austrian, and at last the Bavarian service. Under Alva and other commanders he formed his military talents. At the time of the outbreak of the Thirty Years' war he was in the service of the King of Bavaria, who, being the head of the Catholic League, appointed him to the command of the army destined to crush the Protestants in Bohemia. (See THIRTY YEARS' WAR.) He defeated them on the White Mountains (November, 1620). Afterwards he commanded in the Palatinate, which he conquered in 1622, defeating Ernest of Mansfeld, the Margrave of Baden-Durlach, and Christian of Brunswick. Christian IV.



of Denmark having joined in the war on the side of the Protestant princes, Tilly defeated him on the 27th of August, 1626, at Lutter am Barenberg, in Brunswick, and compelled him to withdraw again to Denmark. When, in 1630, Wallenstein was obliged to give up the command, Tilly was appointed generalissimo of the imperial troops. His most celebrated exploit is the bloody sack of Magdeburg, May 10, 1631. Gustavus Adolphus met him at Breitenfeld, near Leipzig, September 7, and Tilly, who had been thirty-six times victorious, was now entirely beaten, and was himself wounded. In a subsequent engagement with the Swedes on the Lech a cannon-ball shattered his thigh, and he died in a few days, April 20 (o.s.), 1632. Tilly has been styled a monk in the garb of a general. In feeling and belief he was a strict Catholic, in his manners severely ascetic. He was free from avarice and political ambition, and knew no duties besides those of his military profession, and the duties of prayer and religious meditation.

**TILSIT**, a town of East Prussia, in the government of Gumbinnen, and 35 miles N.N.E. of the town of Gumbinnen. It is situated on two rivers, the Niemen (here called the *Memel*), and the small river Tilsa, which separates the town from the castle. It possesses a gymnasium, a higher real school, and various benevolent institutions. Its manufactures are considerable, and consist mainly of iron castings, machinery, paper, glass, soap, oils, cloth, snuff, chemicals, leather, cheese, &c. The eel and salmon fisheries are valuable, and there are large horse and cattle markets. Pop. (1890), 24,550; (1900), 34,538.

The town of Tilsit is celebrated for the peace concluded here in July, 1807, between Russia and Prussia and Napoleon. It was signed by Russia on the 7th and by Prussia on the 9th of July. By the terms of the peace it was settled—1. That the provinces torn from Poland by Prussia in 1793 and 1795 should form a new Duchy of Warsaw; 2. That Dantzic, with a territory 2 leagues in circuit, should be made a free city, under the protection of Prussia and Saxony; 3. That the King of Saxony, made Duke of Warsaw, should have a military road to his new state through Silesia; 4. That the Dukes of Mecklenburg, Oldenburg, and Coburg should be reinstated by the Emperor of the French; and on the other hand, his brother Jerome should be acknowledged by Alexander as King of Westphalia, Joseph as King of Naples, Louis as King of Holland; and 5. That the Kingdom of Westphalia should be formed of the provinces ceded by Prussia situated on the left bank of the Elbe, together with Brunswick, Hesse, &c. At the same time, 6. Alexander ceded the lordship of Jever to Holland, and promised, 7, to withdraw his troops from Moldavia and Walachia, and conclude peace with the Porte, under Napoleon's mediation. On the other hand, Russia received of the Prussian provinces that of Bialystock, 4360 square miles.

**TILT-HAMMER**, a large and heavy hammer, put in motion by a water-wheel or steam-engine. Cogs being brought to bear on the tail of the hammer, its depression causes the head to be elevated, which, when liberated, falls with considerable force by its own specific gravity. Tilt-mills work on the same principle.

**TIMBER**, wood used, or adapted to be used, for building purposes. It is agreed by most writers that the sap of vegetables is the great cause of their fermentation and decay. Hence the best season for felling timber is midwinter, as the trunk of a tree is then less charged with sap than at other times. The middle of summer is the next best season; but for hard woods the season does not matter very greatly. At whatever period timber is felled it requires to

be thoroughly seasoned before it is fit for the purposes of carpentry. The object of seasoning is partly to evaporate as much of the sap as possible, and thus to prevent its influence in causing decomposition, and partly to reduce the dimensions of the wood, so that it may be used without inconvenience from its further shrinking. Timber seasons best when placed in dry situations, where the air has a free circulation round it. Gradual drying is considered a better preservative of wood than a sudden exposure to warmth, even of the sun; for warmth, abruptly applied, causes cracks and flaws, from the sudden and unequal expansion produced in different parts. Two or three years' seasoning is requisite to produce compactness and durability in the wood work of buildings. It must be observed that seasoning in the common way only removes a portion of the aqueous and volatile matter from the wood. The extractive and other soluble portions still remain, and are liable to ferment, though in a less degree, whenever the wood reabsorbs moisture. When wood is to be kept in a dry situation, as in the interior of houses, no other preparation is necessary than that of thorough seasoning. But when it is to be exposed to the vicissitudes of weather, and still more when it is to remain in a warm and moist atmosphere, its preservation often becomes extremely difficult. Numerous experiments have been made, and many volumes written, upon the preservation of timber and the prevention of the dry-rot; but the subject is not yet brought to a satisfactory conclusion. The methods which have hitherto been found most successful consist in extracting the sap, in excluding moisture, and in impregnating the vessels of the wood with anti-septic substances. For extracting the sap the process of *water seasoning* is recommended. It consists in immersing the green timber in clear water for about two weeks, after which it is taken out and seasoned in the usual manner. A great part of the sap, together with the soluble and fermentable matter, is said to be dissolved or removed by this process. Running water is more effectual than that which is stagnant. It is necessary that the timber should be sunk, so as to be completely under water, since nothing is more destructive to wood than partial immersion. It has also been proposed to extract the sap by means of an air-pump, the timber being inclosed in tight cases, with a temperature somewhat elevated, and the sap being discharged in vapour by the operation of the pump. The *charring* of timber, by scorching or burning its outside, is commonly supposed to increase its durability; but on this subject the results of experiment do not agree. Charcoal is one of the most durable of vegetable substances; but the conversion of the surface of wood into charcoal does not necessarily alter the character of the interior part. As far, however, as it may operate in excluding worms and arresting the spreading of an infectious decay like the dry-rot, it is useful. Probably, also, the pyroligneous acid which is generated when wood is burned may exert a preservative influence. The exclusion of moisture, by covering the surface with a coating of paint, varnish, tar, &c., is a well-known preservative of wood which is exposed to the weather. If care is taken to renew the coat of paint as often as it decays, wood on the outside of buildings is sometimes made to last for centuries. But painting is no preservative against the internal or dry rot. On the contrary, when this disease is begun, the effect of paint, by choking the pores of the wood and preventing the exhalation of vapours and gases which are formed, tends rather to expedite than prevent the progress of decay. Paint itself is rendered more durable by covering it with a coating of fine sand. Wood should never be painted which is not the-



roughly seasoned. The most useful method of preserving timber is by subjecting it to the process of creosoting. Moisture and air are first extracted from it, and creosote is then forced by pressure into the tubes. The extraction of the air is generally effected by an air-pump, and the creosote should be at a temperature of 120° when applied to the timber. The process of kyanizing (which see) consists in the application of corrosive sublimate, but careful experiments have proved that it is inferior to creosoting. A more recent method of some value is Boucherie's process, which may be briefly described as the displacement of the sap by copper sulphate solution under a pressure due to gravity. Gardner's process is said to be a very rapid one and exceedingly efficient, especially in strengthening the timber. Its essential feature is the solution of the sap by means of chemicals in open tanks and the subsequent injection of chemicals. Other substances that have been used as preservatives are copper acetate, zinc chloride, iron sulphate, and zinc sulphate. Cyanite, tungstate of soda, asbestos paint, and silicate solutions are among the most useful substances for fire-proofing timber. In recent years the total amount of hewn timber, chiefly fir, imported into the United Kingdom has averaged about 2,700,000 loads or 135,000,000 cubic feet, valued at about £5,500,000. The annual average import of sawn, split, planed, and dressed timber, chiefly fir, is about 6,600,000 loads or 330,000,000 cubic feet, valued at about £16,000,000. The total imports thus amount annually to about 465,000,000 cubic feet, with a value of £21,500,000. Hewn fir comes chiefly from France, Russia, Sweden, Norway, and Germany; hewn oak from the United States, Germany, and Canada; hewn teak mostly from Burma; and the unenumerated kinds from Canada and the United States mainly. Sawn, split, planed, or dressed fir comes mostly from Sweden, Russia, Canada, the United States, and Norway. Furniture and other special woods are not included in the above figures.

**TIMBUCTOO**, or **TIMBUKTE**, a town of Africa, head-quarters of one of the French military territories in the Soudan, one of the leading emporia of the interior trade of the continent, is situated 6 miles north from the main stream of the Niger; lat 17° 37' N.; lon. 3° 5' W. It is about 3 miles in circumference, well built for an African town. The public buildings consist only of three large mosques, one of which has a lofty tower of earth-work, forming a striking landmark. There are no industries of consequence. Timbuctoo is almost entirely dependent on commerce, of which the three great highways converging on this town are the route along the Niger from the south-west, and two routes from the north, one from Morocco and the other from Ghadames. The two leading staples are gold and salt. There is also an extensive traffic in European goods. The French took possession of the town in 1894. Pop. 20,000.

**TIME**, the general idea of successive existence, or that in which events take place, space being that in which things are contained. *Relative time* is the sensible measure of any portion of duration, often marked by some phenomenon, as the apparent revolution of the celestial bodies, especially of the sun, or the rotation of the earth on its axis. Time is divided into years, months, weeks, days, hours, minutes, and seconds (see these terms), but of these only the years and days are marked by celestial phenomena. The instruments employed for measuring time are clocks, watches, chronometers, hour-glasses, and dials (see separate articles). See also **MUSIC** and **TEMPERATURE**.

**TIMES, THE.** The journal now bearing this name appeared for the first time on the morning of the 13th of January, 1785, under the name of the *Daily Universal Register*. Its founder was a London printer named John Walter. It first appeared with its present title on the 1st of January, 1788, when it was called *The Times*, or *Daily Universal Register*. The second title was ultimately dropped. The pre-eminence which this journal can now boast of is due to the second John Walter, the son of the first, who took charge of the paper in 1803. At that time its circulation was only about 1000, while that of the *Morning Chronicle* was about 4500, but it very soon acquired the leading place among London journals in virtue of the accuracy and freshness of its news and the independence of its tone. The chief feature in the new management of *The Times* was the engagement of special correspondents at home and abroad, and the means of transmitting foreign correspondence was so successfully organized that *The Times* often got earlier information of important events than the government itself. The increasing necessity for rapid production led to the introduction of steam printing-machinery in 1814. Two years before, Mr. Walter had given up the literary management of the paper to an editor, reserving to himself only the general direction of the enterprise. The first editor was Dr. Stoddart, who held the post for five years, after which Mr. Thomas Barnes was appointed to it. The principal collaborators under his editorship were Lord Brougham and Edward Sterling (the father of John Sterling). In 1841 Mr. Barnes died, and was succeeded by Mr. John T. Delane. In the same year the fame of the paper was greatly increased by a signal service which it rendered to the commercial world in detecting and thwarting a conspiracy which, if successful, would have defrauded the leading banking-houses of Europe of about a million sterling. An action for libel grounded on the article in which the conspiracy was denounced was, however, brought against the printer of *The Times*. The action, that of *Bogge v. Lawson*, resulted in a verdict for the plaintiff, one farthing damages, each party, however, having to pay his own costs. A number of the principal bankers and merchants, both in England and on the Continent, at once offered to defray the costs themselves, and a sum of £2700 was soon raised with that object. But the proprietors of *The Times* declined the offer, and the money was mainly devoted to the foundation of two scholarships, called the *Times* scholarships, one at Oxford and one at Cambridge. In 1847 the second John Walter died. In 1856 *The Times* began to be printed with stereotype plates. Subsequently the *Walter Press*, partly due to the third Mr. John Walter, was introduced. (See **PRINTING**.) In 1877 was commenced the publication of a weekly edition; there is also published *The Mail* three times a week, giving a summary of the daily issue. In 1887 a series of articles, entitled *Parnellism and Crime*, led to a successful lawsuit against the paper by Mr. Parnell who was awarded £5000 as damages.

**TIMOLEON**, a native of Corinth, born about 400 B.C. In the early part of his life he took a passive part in the assassination of his brother Timophanes, who had usurped the supreme power. He then spent twenty years in voluntary exile, and did not return till he was invited by his fellow-citizens to take the command of the troops which they intended to send to Syracuse in answer to the request of the Syracusans, who had asked the aid of the mother city against the tyrant Dionysius the Younger and the Carthaginians (344 B.C.). The success of Timoleon was remarkable. At the head of a small force (under

1000 men) he first managed to make himself master of Syracuse, from which he expelled Dionysius (348 B.C.), and was taking measures for driving the tyrants out of the other Greek cities of Sicily when he was obliged to meet an invasion of the Carthaginians, who had landed at Lilybæum with an army of 70,000 foot and 10,000 horse, under Hasdrubal and Hamilcar. He collected a force of 12,000 men, with which he totally defeated the Carthaginians on the river Crimisus (339 B.C.). In the following year Hicetas, tyrant of Leontini, Mamercus, tyrant of Catana, and other tyrants of Greek cities, allied themselves with the Carthaginians; but the latter were soon glad to agree to a treaty in which the river Halycus was fixed on as the boundary between the Carthaginian and Greek dominions in Sicily, and the tyrants were one by one expelled from the cities they had seized, and democratic governments set up after their expulsion. He restored their liberty to the Syracusans, recalled the exiles and fugitives, and erected public buildings in place of the fortresses built by the tyrant; gave the citizens a new and more stable constitution; and finally, when he had accomplished his mission, voluntarily laid down his power and retired into private life. The Greek cities of Sicily almost all looked upon him as their benefactor and father, and took no measures of importance without consulting him. All Sicily mourned his death, which occurred not long after, in 337 B.C. He was buried at the expense of the city.

**TIMOR**, a large island in the Indian Archipelago, the largest and most eastern of the Lesser Sunda Islands. It lies north-east and south-west, with a length of about 300 miles and a breadth of 40 miles. It is surrounded by banks and rocks, but has two safe harbours—Koepong on the south, the headquarters of the Dutch; and Dilli or Deli on the north, the chief place of the Portuguese half of the island. High mountain chains traverse the whole island. Everywhere are traces of volcanic origin, and the whole island has frequently suffered from earthquakes. The low-lying lands produce all the tropical trees and plants, and the mountain slopes are covered with the fruits of Southern Europe; but the vegetation generally is poorer and less vigorous than that of the other islands of the archipelago. Agriculture is little attended to. The natives are partly Papuans partly Malays. The trade, chiefly in the hands of Chinese, is carried on mostly through Koepong. The exports are sandal-wood, trepang, wax, horses, tortoise-shell, birds' nests, &c. Pop. 400,000.

**TIMOR LAU'T**, or **TENIMBER ISLANDS**, a group in the Indian Archipelago, between Timor and New Guinea. The largest, Timor Laut, or Yamdena, is about 75 miles long and 25 broad, formed of coral, with steep cliffs, but no hills nor streams. The natives have a bad reputation. Pop. 15,000.

**TIMOTHY**, a disciple of St. Paul, was born in Lycaonia, Asia Minor, probably at Lystra, of a Gentile father and Jewish mother. His father's name is unknown; his mother's was Eunice, his grandmother's Lois. By his mother and grandmother he was early made familiar with the Old Testament Scriptures, and it seems likely that by them also he was first instructed in the Christian faith, which they had probably been won over to on St. Paul's first missionary visit to Lystra, while Timothy was still very young. When St. Paul, along with Silas, visited Lystra on his second missionary journey, seven years after the first, Timothy became an active fellow-worker with the apostle, and he accompanied him and Silas in the further course of their mission. On this occasion St. Paul circumcised him, to satisfy the prejudices of the Jewish Christians. Timothy accompanied Paul to Philippi and Berea; but he is not

mentioned as being with Paul at Thessalonica, which the apostle visited after Philippi and before Berea. He was then left in the last-mentioned city alone, but rejoined Paul at Athens, from which city he was sent back to Thessalonica. After remaining there some time he once more joined his master at Corinth. No further mention is made of Timothy till at least five years later, when he is found with Paul at Ephesus on his third missionary journey. From Ephesus he was sent along with Erastus into Macedonia and Achaia to prepare the churches there for the visit that Paul himself was meditating (Acts xix. 22). Timothy met the apostle again in Macedonia, and was amongst those who preceded him on his journey to Jerusalem. We lose sight of him for the next two or three years; but he appears at Rome with Paul at the time when the epistles to the Colossians, Philippians, and Philemon were written. From the third verse of the first chapter of the first epistle to Timothy we learn that Timothy was on one occasion left at Ephesus when Paul went into Macedonia, and it is supposed that this was after Paul had been released from the confinement in which he was placed when he was sent to Rome from Jerusalem. Tradition makes Timothy the first Bishop of Ephesus. He is said to have been martyred in the reign of Domitian or Nerva.

**TIMOTHY, EPISTLES TO.** These two epistles, along with that to Titus, are called the pastoral epistles, as to the genuineness of which there has been considerable controversy. By the early Christian fathers they were almost universally accepted as genuine. They are ascribed to Paul in the Syriac version of the Scriptures known as the Peshito, believed to belong to the second century, in the Muratorian fragment, a list of the works of the New Testament supposed to have been compiled about 150; and in the catalogue of Eusebius, who places them among the homologoumena (acknowledged). The other external testimony to their genuineness is also strong. They were, however, rejected by some of the Gnostic heretics, as Marcion and Basilides. Tatian accepted the epistle to Titus, but rejected those to Timothy. The question of their genuineness was revived in modern times, at the beginning of the nineteenth century, by Schmidt and Schleiermacher, who admitted the genuineness of second Timothy and Titus, but assailed that of first Timothy. Eichhorn and De Wette denied that any of these epistles was written by Paul, but admitted the canonical authority of them all. More recently, Baur, disregarding external testimony altogether, has assigned them to the latter half of the second century. The chief grounds on which the genuineness of these epistles is questioned are the difference of their style as compared with that of the acknowledged epistles of St. Paul, the assertion that the heresies alluded to in the epistles betray a later age, and that the ecclesiastical polity of the epistles is too complete to belong to the time of the apostles, and the difficulty of finding any part of the apostle's life to which they can be assigned. This last difficulty is generally got over by biblical critics by assigning them to a period after the close of the narrative in the Acts, and the second epistle to Timothy while St. Paul was undergoing a second imprisonment at Rome.

**TIMOTHY-GRASS** (*Phleum pratense*) is readily recognized by its cylindrical spikes from 2 to 5 inches in length. It is a hard coarse grass, not much liked either by horses, cows, goats, or sheep, and swine refuse it. But it is recommended as a constituent of any mixture of grasses for permanent pasture. It grows best in tenacious soils, and is common throughout Great Britain. In North America it is cultivated on a considerable scale for agricultural purposes,

having been first recommended by Timothy Hanson, hence its common name. The root becomes bulbous in dry grounds.

**TIMUR**, called also **TIMUR BEC** and **TIMUR LENG** (that is, *Timur the Lame*), and, by corruption, **TAMERLANE**, a celebrated oriental conqueror, was born in the territory of Kesh, about 40 miles from Samarcand, in the year 1336. His ancestors were chiefs of the district, and boasted of being descended from Genghis. When he was about the age of twenty-five his native country suffered from an invasion of the Kalmucks of Jettah, against whom he acted at the head of a body of his countrymen, until at length the leader of the invading host offered him the government of Kesh under his son. Timur accepted the offer, but after holding the position for a short time allied himself with those who were dissatisfied with the rule of the Jettah Kalmucks, and succeeded in expelling the latter from Turkestan. The government was then divided between Timur and his brother-in-law Hussein, who reigned together in peace for several years, but at last a dispute between the two led to a brief civil war, in which Hussein was defeated and put to death, whereupon Timur alone received the chief power in Turkestan (1370). His elevation, so far from satisfying his ambition, only opened further prospects to it. By degrees he conquered Persia and the whole of Central Asia, from the great wall of China to Moscow. His principal enemy at this part of his career was Toktamash, the ruler of Kaptshak (the region in the south-west of Russia, see **GOLDEN HORDE**). He had been indebted to Timur for aid in establishing himself in that dominion, but after he had done so turned his arms against him and obliged him to contend for his capital and empire. He was, however, finally defeated. In 1398 Timur invaded India, which he conquered, from the Indus to the mouths of the Ganges. All his wars were signalized by great bloodshed and cruelty, but none so much so as this, during which he is said to have massacred on one occasion all his prisoners to the number of 100,000. While on the banks of the Ganges he was informed of great disturbances on the confines of Georgia and Anatolia, and of the hostile preparations of the Turkish Sultan Bajazet. On his way from India he subjugated Bagdad, plundered Aleppo, burned down the greater part of Damascus, and wrested Syria from the Mamelukes, after which he overran the sultan's dominions in Asia Minor with an immense army. The battle fought on the plain of Ancyra (Angora) in 1402 was decisive. Bajazet's army was completely defeated and he himself taken prisoner. Concerning the treatment of his prisoner different accounts are given, the most common of which states that he was carried about by the conqueror in an iron cage, against the bars of which he, in a few months, beat out his brains in rage and despair. This, however, is generally regarded as a fable. Timur seems, in fact, to have treated his exalted prisoner at first with great lenity and respect, and not to have shown any severity until he heard of a plot for his prisoner's escape. The conquests of the Tartar now extended from the Irtish and Volga to the Persian Gulf, and from the Ganges to the Archipelago; and the want of shipping alone prevented him from crossing into Europe. His inordinate ambition was not yet satisfied, and he was making mighty preparations for an invasion of China when death arrested his progress at his camp at Otrar, and he expired in 1405. Timur was tall and corpulent, with a wide forehead, large head, and pleasing countenance; but he was maimed in one hand, and lame on the right side. He conducted his government alone and without favourites, but was, to the highest degree, fierce and fanatical in his

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religion; and although no conquests were ever attended with greater cruelty, devastation, and waste of human life, he affected the title of a benefactor to mankind. Yet he was not a mere barbarian conqueror. He was in a measure a patron of science and the arts, and settled at his favourite seat of Samarcand great numbers of men of learning and artists whom he made prisoners in his wars. He is also a reputed author. The principal works ascribed to him are the Institutions of Timur, which have been made known to us by a version from the Persian, executed by Professor White (Oxford, 1783); and the *Mulfuzat Timury*, or Autobiographical Memoirs of Timur, translated into English by Major Stewart (1830). The principal authority for the events of Timur's life is Sherif-ed-din-Ali's history, translated into French by Pétis de la Croix, under the title of *Histoire de Timur-bee* (Paris, three vols., 1722). See Sir H. Howorth's History of the Mongols.

**TIN**, a hard, white, ductile metal, obtained by smelting tin-stone. A knowledge of the properties of this metal has descended to us from very remote antiquity. Tin appears to have been known in the time of Moses; and at a somewhat later period in Jewish history it was brought by the ships of Tarshish from the islands east of the Persian Gulf. The Phœnicians traded largely in the tin ores of Cornwall, which was then, as now, celebrated for its mineral wealth. The mountains which separate Galicia from Portugal were also very productive of tin in ancient times, and still continue unexhausted. The mountains between Saxony and Bohemia have been wrought as tin mines for several centuries, and still continue productive. Mines of it occur in the Peninsula of Malacca, in India, in Chili, in Mexico, in Peru, &c. Large deposits of tin-stone have been discovered in Queensland, New South Wales, and Tasmania. Tin-stone (or peroxide of tin) is the only ore used for obtaining metallic tin. It is found disseminated throughout the alluvium of the valleys, or in lodes at considerable depths beneath the surface; the former deposits yield what is called *stream-tin*, while from the latter *mine-tin* is obtained. The first process to which the ore is subjected is grinding. The ground ore is then washed, which removes the impurities; for the specific gravity is so high that it is easy to wash away the earthy matter, and even some of the foreign metallic ores with which it is often mingled. But there are other bodies so nearly of the same specific gravity of the tin ore that they cannot be thus removed. The ore is then roasted in a reverberatory furnace, whereby the sulphur and arsenic are expelled. The ore, thus freed as much as possible from foreign matter, is mixed with the requisite fuel and limestone, and heated strongly in a reverberatory furnace, so as to bring the whole into the state of fusion, which is kept up for about eight hours. The lime unites with the earthy matters still mixed with the ore and flows with them into a liquid slag, while the coal reduces the oxide of tin to the metallic state. The reduced tin falls by its own weight to the bottom, and is, at the end of about eight hours, let out by tapping a hole in the furnace which had been filled with clay. The tin thus obtained is still very impure; it contains generally iron, copper, arsenic, and tungsten. In order to purify it the blocks of tin are placed in a reverberatory furnace and moderately heated until the tin melts and flows into the refining basins, while the greater part of the foreign metals remains in the solid state. The molten tin in the refining basins is then stirred with pieces of green wood, whereby gases are given off, and the metal is maintained in a state of artificial ebullition. The upper parts of the contents of the basins are oxidized and removed from the surface, while the greater part

of the foreign metals collects at the bottom. The metal is allowed to partially cool, during which process it separates into zones, the upper consisting of nearly pure tin, while the under is so impure that it must be returned to the furnace and again melted. The upper layer of tin is removed into moulds, containing each about 3 cwts., in which it is allowed to solidify; it is then sent into the market as *block-tin*, the purest specimens being called *refined tin*.

Tin, when pure, has a fine white colour like silver, and when fresh its brilliancy is great. It has a slightly disagreeable taste, and emits a peculiar smell when rubbed. Its hardness is between that of gold and lead. Specific gravity, 7.28. It is very malleable; tin-leaf, or *tin-foil*, as it is called, is about  $\frac{1}{1000}$ th part of an inch thick; and it might be beat out into leaves as thin again, if such were wanted for the purposes of art. Its ductility and tenacity are much inferior to those of most of the metals known in early times; a bar of tin a quarter of an inch in diameter will not support a greater weight than 294 lbs. Tin is very flexible, and produces, while bending, a remarkable crackling noise, sometimes called the *cry of tin*. It melts at about  $230^{\circ}$  C. When cooled slowly it may be obtained crystallized in the form of a rhomboidal prism. By washing the surface of a mass of tin with warm dilute aqua regia it becomes covered with a number of crystals, which, from their unequal action upon light, give an appearance to the metal somewhat resembling that of watered silk. After a short exposure to the air tin loses its lustre and assumes a grayish-black colour, but undergoes no further alteration. Neither is it sensibly altered by being kept under water. When tin is melted in an open vessel its surface becomes very soon covered with a gray powder, which is an oxide of the metal. If the heat be continued the colour of the powder gradually changes, and at last it becomes yellow. To tin the symbol Sn (from the Latin *stannum*) and the atomic weight 118.5 are given. Tin forms two oxides—*protoxide* or *stannous oxide*, and *peroxide* or *stannic oxide*. The former (SnO) may be obtained by dissolving tin in hydrochloric acid till a saturated solution is obtained, precipitating the liquid by means of carbonate of soda, and collecting the precipitate on a filter, washing, and drying it in a stream of hydrogen or carbon dioxide, at a temperature not exceeding  $80^{\circ}$  C. *Stannous oxide* is a black powder, devoid of lustre, tasteless, and insoluble in water. When heated in the open air it takes fire, burns brilliantly, and is converted into peroxide. It is distinguished from the peroxide not only by its colour, but by being insoluble in ammonia and in carbonate of potash. *Stannic oxide* (SnO<sub>2</sub>) exists abundantly in nature, though rarely free from admixture with iron. It may be prepared by heating tin in contact with air, whereby an amorphous, yellowish-white powder is obtained. By igniting this powder in a rapid current of hydrochloric acid gas crystallized stannic oxide is obtained. Two of the hydrates of tin have acid properties, and form salts called *stannates* and *meta-stannates*. Tin combines with chlorine in two proportions, forming *stannous chloride* (SnCl<sub>2</sub>) and *stannic chloride* (SnCl<sub>4</sub>). The former of these may be formed by heating together tin amalgam and calomel, or by heating the metal in hydrochloric acid gas. It has a gray colour, a resinous lustre and fracture, and takes fire when heated in chlorine gas, and is converted into the perchloride. When tin is dissolved in hydrochloric acid crystals of hydrated stannous chloride are obtained, which are sent into the market under the name of *tin-salt* or *tin-crystals*. Stannic chloride has long been known under the name of *fuming liquor of Libavius*, this name being given because it was discovered by Libavius, a chemist

of the sixteenth century. It is usually prepared by mixing together tin and corrosive sublimate, and distilling with a very moderate heat. At first a colourless liquor passes into the receiver, consisting chiefly of water; then the fuming liquid rushes all at once into the receiver in the state of vapour. It is a colourless, mobile liquid, having a specific gravity of 2.26. When three parts of it are mixed with one of water the mixture condenses into a solid mass. It acts with great violence on oil of turpentine. There are compounds, also, of tin with bromine and with iodine. Tin also combines with phosphorus and with sulphur. One combination of tin and sulphur (*stannic sulphide*, SnS<sub>2</sub>) has long been known in chemistry under the name of *aurum mosaicum* or *mosaic gold*. It is formed by mixing twelve parts tin, seven parts sulphur, three parts mercury, and three parts sal-ammoniac, and exposing the mixture to a strong heat for eight hours in a loosely-covered flask placed on a sand-bath. The mosaic gold sublimes. It may also be formed by mixing together in a retort equal parts of sulphur and oxide of tin, and distilling. When pure it is in the form of light scales, which readily adhere to other bodies, and which have the colour of gold. Tin and arsenic may be alloyed by fusion. The alloy is white, harder and more sonorous than tin. Tin and antimony may be united together in various proportions. Equal parts of tin and molybdenum melt into a blackish-gray, granular, brittle, soft mass. Tin does not combine readily with iron. An alloy, however, may be formed by fusing them in a close crucible completely covered from the external air.

*Tin-plate* is formed by dipping into melted tin thin plates of iron or steel, thoroughly cleaned by rubbing them with sand and then steeping them twenty-four hours in water acidulated by bran or sulphuric acid. The tin not only covers the surface of the iron, but penetrates it completely, and gives the whole a white colour. Tin and zinc may be easily combined by fusion. This alloy is often the principal ingredient in the compound called  *pewter*. Lead and tin may be combined in any proportion by fusion. The alloy is harder, and possesses much more tenacity than tin; and these qualities are at a maximum when the alloy is composed of three parts of tin and one of lead. What is called *ley-pewter* is often scarcely anything else than this alloy. *Tin-foil*, too, is almost always a compound of tin and lead. It is in the formation of these alloys that tin is principally employed. Its oxides are used in enamelling, and for polishing the metals; and its solution in nitro-muriatic acid is an important mordant in the art of dyeing, rendering several colours, particularly scarlet, more brilliant and permanent.

*Tin Ores*.—These are but two in number, *tin ore* and *tin pyrites*. The first of these occurs crystallized, and in a great variety of forms, which may all be derived from an octahedron with a square base, the angle over the apex being  $112^{\circ} 10'$ . The majority of the crystals have the general figure of a right square prism, with four-sided pyramids at each extremity. The cleavages take place parallel with the sides of this prism, and with both its diagonals. The crystals may be cleaved also parallel to the sides of the above-named octahedron, but with difficulty. The prisms are sometimes vertically streaked. Lustre adamantine; colour various shades of white, gray, yellow, red, brown, and black; streak pale gray, in some varieties pale brown; semi-transparent, sometimes almost transparent, and in others opaque; brittle; hardness about that of feldspar, specific gravity, 6.96. Tin ore presents itself in a great variety of compound or maced crystals. It also occurs reniform, rarely in botryoidal shapes, and massive, with a granular or columnar composition,

the individuals being strongly connected and the fracture uneven. The wood-tin of the Cornish mines is a mere variety of tin ore. The following ingredients were found in a specimen of crystallized and in a massive tin ore:—

	Crystallized.	Massive.
Oxide of tin.....	99.00 ..	95.00
Oxide of iron.....	0.25 ..	5.00
Silica.....	0.75 ..	0.00

In its greatest purity it contains nothing but oxide of tin. Alone it does not melt before the blowpipe, but is reducible when in contact with charcoal. It occurs disseminated through granite, also in beds and veins. It also occurs in pebbles, and is extracted in this shape from stream-works. The variety called wood-tin has hitherto been found only in these repositories. *Tin pyrites*, the other ore of tin, occurs massive, with a granular composition; fracture uneven, imperfectly conchoidal; lustre metallic; colour steel-gray, inclining to yellow; streak black; opaque; brittle; hardness about that of fluor-spar; specific gravity, 4.35. Before the blowpipe sulphur is driven off, and the mineral melts into a blackish scoria, without yielding a metallic button. It is soluble in nitro-muriatic acid, with precipitation of part of the sulphur. It contains from 14 to 30 per cent of tin. It is found at St. Agnes in Cornwall, in Saxony, and in Bolivia.

The quantity of tin produced in the United Kingdom was 4268 tons in a recent year. The quantity imported in 1901 was 35,397 tons, three-fourths from the Straits Settlements, and the rest chiefly from Australia, Holland, Chili, and Bombay.

**TINAMOU**, a family (Tinamidae) of partridge-like birds, of which one of the best-known forms is the Elegant Tinamou (*Calopezus elegans*). These birds occur in South America, the species just named being common in Chili. It is larger than our common grouse, and the colour is a mixture of gray and brown tints. The head possesses a tuft or crest. The wings have the third and fourth quills longest, and the tail is short. The bill is short and hooked, and the nostrils exist at its base.

**TINCAL**. See BORACIC ACID.

**TINCTURE**, a solution of any sort of drug in a spirituous liquid. Either proof-spirit or rectified spirit is used.

**TINDAL**, MATTHEW, a controversial writer and deist, born about 1653 at Beer Ferris, in Devonshire, where his father was a clergyman, was admitted of Lincoln College, Oxford, in 1672, became B.A. in 1676, in 1678 was elected a fellow of All Souls' College, and afterwards became a Doctor of Civil Law, and an advocate of Doctors' Commons. In the reign of James II. he turned Roman Catholic, but in 1688 he returned to the Church of England. He published several pieces, political and theological, among which were a Letter to the Clergymen of the two Universities, on the subject of the Trinity and Athanasian Creed, and a treatise entitled the Rights of the Christian Church asserted against Priests (1706). This work excited a considerable sensation among the high church clergy, who attacked it with great animosity. Tindal published two defences of it, which the House of Commons ordered to be burned by the common hangman, along with the original treatise. In 1730 he published his Christianity as Old as the Creation, or the Gospel a Republication of the Religion of Nature, in which his object was to show that there cannot be any revelation distinct from the internal revelation of the law of nature in the hearts of mankind. This deistical or rationalist work—by which his name is chiefly known—received a great many answers. He died in 1733.

**TENDALL**, or **TYNDAL**, WILLIAM, English re-

former and translator of the Bible, was born on the Welsh borders about 1490. He entered the University of Oxford in 1510 under the name of William Hychyns, and graduated B.A. in 1512, M.A. in 1515. He subsequently went to Cambridge, where he resided till 1521, and about this latter date he became tutor to the children of Sir John Walsh, a landed gentleman in Gloucestershire. He preached with great acceptance in the neighbourhood, but soon got into trouble owing to his unorthodox views. In 1523 he went to London, where he came under the influence of Luther's teaching. It was at this time that he began his translation of the New Testament, but finding it unsafe to carry out such a work in England, he went to Hamburg in 1524, and immediately afterwards to Luther at Wittenberg, where he remained till April, 1525. During this time he was proceeding with his translation, with the assistance of one William Roy, and the printing of it was begun at Cologne in 1525. A Roman Catholic clergyman, John Cochläus, came to know of this, and obtained an injunction ordering the stoppage of the work, whereupon Tindal went to Worms and had the work printed there. It was smuggled into England in 1526, and at once Archbishop Warham and Bishop Tunstall took the lead in seizing and burning copies. Attempts were also made to get hold of Tindal, but he fled to Marburg, where he enjoyed the protection of the landgrave of Hesse. Here he became a Zwinglian in his attitude on the eucharist, and published some of his most important original works, including The Parable of the Wicked Mammon (1528); The Obedience of a Christian Man, and how Christian Rulers ought to Govern (1528; new edn., by Lovett, 1888); and The Practyse of Prelates (1530). He engaged in a vigorous polemic with Sir Thomas More. From Marburg he went to the Netherlands, and for several years he resided in Antwerp, but towards 1533 he had to leave that city for a time owing to Henry VIII.'s efforts to seize him. In 1535 he was captured at Antwerp by the imperial officers, assisted by an English Roman Catholic student named Phillips who professed to adopt his reforming opinions. He was lodged in the state prison at Vilvoorden, near Brussels, and despite some efforts to save him made by Cromwell and others, he was tried for heresy, condemned, degraded from holy orders, and sentenced to death. On August 6, 1536, he was strangled and burnt at Vilvoorden. A fragment of the interrupted Cologne print of his New Testament translation is in the British Museum, and there are two extant copies of the first edition of his complete New Testament (1525), one (practically complete) in the Baptist College, Bristol, the other (incomplete) in St. Paul's Cathedral. A revised edition was issued by him at Antwerp in 1534, and a further revision in the following year. His translation of the Pentateuch appeared at Marburg in 1529-30, and that of Jonah at Antwerp in 1531; a copy of each is in the British Museum. Tindal's translation is of much importance in the history of English style and English literature, and it formed the basis, as far as it went, of the Authorized Version of nearly a century later. There is an edition of Tindal's original works by the Parker Society (three vols., 1848-50). See the Life by Demaus (1871; new edn., 1886).

**TINDER**, the name given to any substance artificially rendered readily ignitable but not inflammable, and formerly used as a means of procuring fire. The tinder was ignited by sparks obtained from flint struck with a piece of steel, and when a flame was wanted the ignited tinder was brought into contact with matches dipped in sulphur. Tinder

may be made of half-burnt linen, and of various other substances, such as amadou or German tinder (which see).

**TINEA.** See RING-WORM.

**TINNEVELLY**, a town in India, in the presidency of Madras, about 45 miles from the extreme southern point of the peninsula, and a little more than 30 miles from the eastern coast, the chief town of the district of the same name, and residence of the district judge and collector. There is a fine Dravidian temple here, and the place is a centre of Protestant missions. The cantonment of Palamcottah is about 3 miles distant. Pop. (1891), 24,768; (1901), 40,469.

**TINOS**, or **TINO** (anciently, *Tenos*), an island in the Grecian Archipelago, one of the Cyclades, immediately south-east of Andros; area, about 85 square miles. It is one of the most agreeable and fertile of the Cyclades, is well watered by springs, and has an excellent climate. Its chief exports are wine, white marble, and dark-green serpentine. There is a Greek archbishop and a Roman Catholic bishop; and also a cathedral. The town of same name is situated near the south coast. Pop. of the island in 1896, 12,300; of the town, 2415.

**TIN-PLATE.** See TIN.

**TINTAGEL**, a parish of England, on the coast of Cornwall, 19 miles west by north of Launceston, till 1832 a parliamentary borough returning two members. There is an old Gothic church of various periods. A little to the north, on a small peninsula, stands Tintagel Castle, the reputed birthplace of King Arthur and a centre of many romantic stories. What remains of the structure mainly dates from the beginning of the thirteenth century. There are some slate quarries in the vicinity.

**TINTERN ABBEY**, a magnificent ruin beautifully situated amongst wooded hills on the right bank of the river Wye in Monmouthshire, 8 miles south of Monmouth. It was founded for the Cistercians by Walter de Clare in 1131. The church was begun in 1287, and remains almost in its entirety, a splendid specimen of the transition from the Early English to the Decorated style. On the dissolution of the abbey under Henry VIII. the lands were given to the Earl of Worcester. The name of the abbey is associated with one of Wordsworth's noblest poems, the *Lines* written a few miles above Tintern Abbey, on Revisiting the Banks of the Wye, in which, however, he makes no reference to the ruin.

**TINTORETTO**, a great Venetian painter, whose real name was *Jacopo Robusti*, was the son of a dyer (Italian, *tintore*), whence his usual surname. He was born at Venice on Sept. 16, 1518, and became a pupil of Titian, but was soon dismissed by his master, perhaps through fear of rivalry. He thereupon worked indefatigably without a master, taking as his ideal in painting a union of the design of Michelangelo with the colouring of Titian, and he rapidly obtained a commanding position. He painted with such extraordinary facility and rapidity as to gain the epithet *Il Furioso*, but the consequence was that he produced works of very unequal merit. Annibale Carracci said that he was sometimes equal to Titian, often inferior to Tintoretto. He treated Scripture subjects in a perfectly naturalistic spirit, but at times this became decidedly coarse. Ruskin estimates Tintoretto very highly, and places him among the supreme painters. He died in Venice on May 31, 1594. The greater number of his works are to be found in his native city, and of these the following may be named:—In the Palace of the Doges: Paradise, the largest oil-painting in the world, with a very large number

of figures; The Delivery of the Doge's Insignia to Niccolò da Ponte; Recapture of Zara; Forge of Vulcan; Mercury with the Graces; Minerva driving back Mars; Descent from the Cross; &c. In the Academy: St. Mark descending to the Rescue of a condemned Christian Slave, one of his best works; Adoration of the Kings; &c. In the church of Madonna dell' Orto: The Last Judgment (described in Ruskin's *Modern Painters*), Adoration of the Golden Calf, Miracle of St. Agnes, and Presentation in the Temple. In S. Maria Mater Domini: Finding of the Cross; in San Rocco, and especially its Scuola: many works (described in Ruskin's *Stones of Venice*), including the Crucifixion (1565), by some regarded as his masterpiece; in Santa Maria della Salute: Marriage at Cana; and in S. Marciliano: St. Marcellian with SS. Peter and Paul, his last work. The Uffizi gallery at Florence contains some of his works, including Abraham's Sacrifice and a Marriage at Cana; and the Pitti Palace contains, among others, a Descent from the Cross, Vulcan with Venus and Cupid, and a Madonna. The Prado Museum at Madrid is rich in works by Tintoretto, amongst them being many portraits; and others are to be seen in the National Gallery at London (St. George destroying the Dragon, Christ washing the Feet of His Disciples), Berlin, Dresden, Vienna, Paris, &c. A son, DOMENICO (1562–1637), and a daughter, MARIETTA (1560–90), were also well known as painters. See Ruskin's works; the monograph (1879) by W. R. Osler; and the *Life* (1895) by Stearns.

**TIPPERARY**, an inland county in Ireland, in the province of Munster, bounded on the north by Galway and King's counties; on the east by King's and Queen's counties and Kilkenny; on the south by Waterford; and on the west by Cork, Limerick, Clare, and Galway; area, 1,061,731 acres, of which fully one-fifth is under tillage, about three-fifths in pasture, a fiftieth in plantations, and fully one-seventh waste, bog, mountain, &c. The principal mountain-groups are the Knockmeleadow mountains, in the south-west of the county; the Galtees, a short range between the Suir and the borders of Limerick; and the Keeper and Devil's Bit Mountains, forming a continuous range in the north. None of these ranges attains a greater elevation than 3000 feet. The soil of the level country is a rich calcareous loam, of extraordinary fertility, particularly in the tract called the Golden Vale, extending from Limerick to the confines of Kilkenny, and in another similar tract in the Ormonde baronies. The level country forms part of the great central plain of Ireland, and includes some branches of the Bog of Allen. The mineral productions are coal, copper, zinc, and richly argentiferous lead; and slates of a good quality are extensively raised near Killaloe. The principal crops are oats, potatoes, and wheat. Grazing is the principal employment. Dairies are numerous, affording an export of large quantities of butter. Tipperary returns four members to Parliament. Principal towns—Clonmel, Carrick-on-Suir, Nenagh, Tipperary, Thurles, Cashel, Roscrea, and Templemore. Pop. in 1891, 173,188; in 1901, 159,754.

**TIPPERARY**, a market town in Ireland, capital of the county of the same name, on a gentle slope towards the small river Arra, at the base of the Slievenamuck Hills, in the centre of the Golden Vale, 98 miles south-west of Dublin, with which it is connected by railway. Besides churches, it has a large endowed grammar-school, technical schools, a convent, town-hall, barracks, a butter-market, and a corn and provision market. The chief trade of the town is in butter. Pop. (1881), 7274; (1901), 6281.

**TIPPOO SAIB**, Sultan of Mysor, son of Hyder Ali, born in 1749, succeeded his father in 1782. (See



**HYDER ALI KHAN and MYSOR.** He continued the war in which his father was engaged with the British, but was compelled to abandon the Carnatic, where he had hitherto been operating, in order to check the advances of the British on the Malabar coast. With a vastly superior force he marched against the British commander Matthews, who in April, 1783, was compelled to surrender at Bednor or Nagar. Matthews and a part of the garrison were put to death. After an obstinate defence Mangalore also fell into his hands; but in March, 1784, after Tippoo had been deprived of the assistance of the French by the Peace of Versailles (September, 1783), and the British had concluded an alliance with the Mahrattas, he was induced to sign the Treaty of Mangalore on advantageous terms. In 1787 he again attacked the Mahrattas, and in 1789 turned his arms against the Rajah of Travancore, an ally of the British. An offensive and defensive treaty was concluded (June, 1790) between the East India Company, the Peishwa of the Mahrattas, and the Nizam. In the campaign of 1790 several places were reduced by the allies, and in that of 1791, in which Lord Cornwallis commanded in person, they besieged Tippoo in his capital, Seringapatam. A peace was concluded February, 1792, by the terms of which the Sultan of Mysor consented to relinquish nearly half of his territory, and to pay 33,000,000 rupees. But Tippoo was unwilling to submit to this loss, and entered into negotiations with the French. Suspecting that the preparations of Tippoo were connected with Bonaparte's invasion of Egypt, and receiving from him only evasive answers to their inquiries, the Company determined to anticipate hostilities, and on the 22nd of February, 1799, in connection with their former allies, they declared war against the sultan. Two armies under Generals Stuart and Harris entered Mysor, defeated Tippoo in two battles, and formed a junction before Seringapatam, whither he had retreated. The place was reduced by storm by General Baird, May 4, and Tippoo perished in the assault.

**TIPTON**, a town of England, in Staffordshire, 1½ mile from Dudley, and within the parliamentary limits of the borough of Wednesbury. It depends chiefly on the manufacture of heavy iron goods, such as anchors and cables, iron-work for railways and bridges; but it has also an electrical work and a Moud gas-work. A public park was opened in 1901. Pop. (1891), 29,314; (1901), 30,543.

**TIRABOSCHI, GIROLAMO**, the historian of Italian literature, was born at Bergamo on Dec. 18, 1731, and received his education at the Jesuit College of Monza. Entering the priesthood, he taught in schools at Milan and Novara, and afterwards was appointed to a professorship of rhetoric in the former city. At the time of his death, which took place near Modena on June 3, 1794, he was librarian to Francis III., Duke of Modena. Tiraboschi's *magnum opus* is the *Storia della Letteratura Italiana* (13 vols., 1772-81; 2nd edn., 16 vols., 1787-93), which is the basis of all subsequent histories of Italian literature.

**TIREE, or TYREE**, an island of the Hebrides, belonging to Argyllshire, 15 miles west of Mull and south-west of Coll, about 13 miles long, and from 1 to 5 broad. Its surface is flat, but rises in Carnan Mor to 460 feet; it has few streams, but several small lakes. The soil is remarkably fertile. There are some antiquities here, such as small *duns* or towers, standing-stones, and the remains of ecclesiastical buildings. The inhabitants are employed in farming and fishing. Marble is abundant, but not worked. The exports are horses, cattle, sheep, grain, potatoes, poultry, and eggs. There is regular steamer

communication between Oban and Scarnish on the east coast. Pop. in 1891, 2449; in 1901, 2192.

**TIRESIAS**, in Greek mythology, a Theban soothsayer, said to have been struck blind because he had revealed to men things which they ought not to know, or because he had seen Athena bathing. Athena gave him a staff, by the aid of which he could walk as safely as though he had his eyesight, and she also conferred upon him the power to understand the voices of the birds, while Zeus gave him the gift of prophecy and long life. He died in extreme old age. Tennyson has a poem on the subject of Tiresias, who figures in many Greek legends.

**TIRLEMONT** (Flemish, *Thienen*), a town of Belgium, in South Brabant, on the Geete, and the railway from Louvain to Liège. The chief edifice of interest is the church of St. Germain, probably belonging to the twelfth century. Tirlemont has manufactures of machinery, woollens, &c., and a considerable trade. The town was ravaged by Marlborough in 1705, and in the vicinity the French defeated the Austrians on March 16, 1793. Pop. (1897), 17,284.

**TIRNAU, or TYRNAU** (Hungarian, *Nagy-Szombat*), a town of Hungary, in the comitat and 23 miles north-east of Pressburg, with places of worship for Protestants, Greek Catholics, and Jews, a Jesuit and a Franciscan convent, orphanage, hospital, &c. It is a very old town, and was formerly a royal free city. Pop. (1890), 11,500; (1900), 13,181.

**TIRNOVA, or TERNOVA**, a town of Bulgaria, on the Jantra, 76 miles west by south of Shumla. It has numerous mosques, churches, and synagogues, and is the see of a Greek bishop. Pop. (1893), 12,858.

**TIROL.** See **TYROL**.

**TIRYNS**, a town of ancient Greece, in Argolia, near the head of the Argolic Gulf, some 10 miles south by east of Mycenæ. It was celebrated even in Homeric times for its massive Cyclopean walls, which were the wonder of later ages. The citadel was built on a rocky height, but much of the town lay on the plain at the foot of the hill. The foundation of the town was ascribed to Proetus, and in 468 B.C. it was destroyed by the Argives. Considerable ruins of the citadel and the walls are still to be seen, and excavations carried on in 1884-85 under the direction of Schliemann resulted in the discovery of the complete plan of a large palace. See Schliemann's *Tiryns* (1886) and Perrot and Chipiez's *Histoire de L'Art dans L'Antiquité* (vol. vi., 1894).

**TISCHENDORF, KONSTANTIN VON**, a distinguished textual critic of the Bible, was born at Lengenfeld, in Saxony, on Jan. 18, 1815, and was educated at Leipzig, where he qualified as a lecturer in 1840. In the latter year he went to Paris and deciphered the Codex Ephræmi, and soon afterwards he began to travel extensively in Europe, Egypt, Sinai, and Palestine in search of Biblical manuscripts. In 1844 he was fortunate enough to save from the flames in the Convent of St. Catherine on Mount Sinai a valuable manuscript of the Old Testament, but he failed to get possession of more than a part of it. This part he published in facsimile in 1846 as the Codex Friderico-Augustanus, so named in honour of his patron, the King of Saxony. He was appointed in 1845 extraordinary professor, in 1850 ordinary honorary professor, and in 1859 ordinary professor of theology and Biblical paleography at Leipzig. He again visited the East in 1853, and in 1859 he made a third visit at the cost of the Russian government. On the third journey to Sinai he brought back the rest of his Codex Friderico-Augustanus, better known as the Codex Sinaiticus, the oldest Greek manuscript of the



Bible, containing the entire New Testament and the Epistle of Barnabas, besides much of the Old Testament. (See CODEX SINAITICUS.) A magnificent facsimile edition was published in four volumes at St. Petersburg in 1862. In 1869 Tischendorf was ennobled by the emperor. He died at Leipzig on Dec. 7, 1874. Among Tischendorf's contributions to the textual criticism of the New and the Greek Old Testament are the following editions: Codex Ephræmi Syri (1843); Codex Friderico-Augustanus (1846); Monumenta Sacra Inedita (1846); Evangelium Palatinum Ineditum (1847); Codex Amiatinus (1850); Codex Claromontanus (1852); Novum Testamentum Vaticanum (1867); Appendix Codicum celeberrimorum Sinaitici Vaticani Alexandrini (1867); and Monumenta Sacra Inedita: Nova Collectio (1855-70). He issued several editions of the Greek New Testament, of which the eighth critical edition (two vols., 1864-72) is of great importance. In his Novum Testamentum Triglotum (1854) he printed together his Greek text, the Latin of Jerome, and the German of Luther. His Synopsis Evangelica (5th edn., 1854) should also be mentioned in connection with this part of his work. He edited the Septuagint with critical apparatus (1850; 7th edn., 1887), and on the New Testament apocrypha and pseudepigrapha he published: De Evangeliorum Apocryphorum Origine et Usu (1851); Acta Apostolorum Apocrypha (1851); Evangelia Apocrypha (1853); and Apocalypses Apocryphæ (1866). In Wann wurden unsere Evangelien verfasst? (1865; Eng. trans.) he shows a strongly conservative tendency. He described his travels in the works Reise in den Orient (two vols., 1845-46) and Aus dem Heiligen Lande (1862).

**TISSUE**, a group of similar cells in an animal or plant body discharging the same function and having the same origin. Tissues may be classified either according to their structure when completely developed, or in accordance with the functions discharged by them, or on the basis of their mode of origin. A common classification of animal tissues is as follows: (1) Epithelial Tissue; (2) Connective Tissue; (3) Muscular Tissue; (4) Nerve Tissue. Epithelial tissue, or epithelium, consists of cells closely placed together, with little or no intercellular substance. If in one layer, it is called simple; if in more than one, stratified; and it is further distinguished by adjectives such as globular, squamous, columnar, and ciliated, denoting the character of the individual cells. It is found in all parts of the body, as, for example, on the surface of the skin, the lining of the mouth, throat, and alimentary canal, the lining of the air-passages and recesses of the lungs, the nostrils, the canal of the ear, the surface of eyelids and eyeballs, &c. When its purpose is purely protective it is usually squamous or short columnar and often stratified, but if it have secretive functions it is generally globular or long columnar and simple. Connective tissue is of many kinds, which may be grouped under the three main heads: (a) connective tissue proper; (b) cartilage or gristle; (c) bone and dentine. True connective tissue includes white fibrous tissue, yellow elastic tissue, adipose or fatty tissue, cellular or areolar tissue, adenoid tissue, and mucous tissue. All connective tissues consist of three essential parts, a matrix, cells, and fibres. The matrix is prominent in hyaline cartilage, but inconspicuous in the true connective tissues, and in bone and dentine it is infiltrated with calcium salts. The cells are known in the three main groups respectively as connective tissue corpuscles, cartilage cells, and bone corpuscles. The fibres are of two kinds, namely, the fine, transparent, wavy white fibres and the

coarse, elastic yellowish fibres. White fibrous tissue is found in the skin, tendons, membranes, muscles, &c., and when boiled it yields gelatin. Yellow elastic tissue gives elasticity to the skin and the coats of blood-vessels, and does not yield gelatin on boiling. Cellular tissue consists of a mesh-work of white fibres with some yellow fibres, and occurs in large quantity beneath the skin, around the muscles, blood-vessels, and nerves, and in many other parts of the body. Fatty tissue consists of a mesh-work of white fibrous tissue in which fat cells are embedded. It is found beneath the skin, around various internal organs, in the marrow of bones, and elsewhere, and is both protective and heat-retaining in its function. Mucous tissue is merely a stage in the development of ordinary connective tissue. Adenoid tissue, found in the glands, consists of a net-work of very delicate connective tissue, in which white cells of various sizes are entangled. The cartilage or gristle of the joints is of three kinds: hyaline, with a glossy matrix containing the cells; white fibrous, with the matrix pervaded and almost replaced by white fibrous tissue, disposed in layers of bundles; yellow fibrous, with yellow elastic fibres forming a basket-work. For the other animal tissues see BONE, TEETH, MUSCLE, NERVE; and for vegetable tissues see BOTANY. The branch of science which treats of tissues is called *histology*.

**TITANIA.** See MAB.

**TITANIUM**, a comparatively rare metal discovered in 1789 by Gregor in menachinite from Cornwall, and thence called *menachin*. In 1795 Klaproth discovered a new metal in rutile, to which he gave the name of titanium; a few years later he showed that this metal was identical with Gregor's menachin. Titanium has not been found in the metallic state; it usually occurs as an oxide, associated with iron, lime, silica, &c., sometimes also associated with the rarer earth metals—cerium, yttrium, &c. The principal titanium minerals are *rutile*, *brookite*, *anatase*, *sphene*, and *titaniferous iron ores*. *Rutile* occurs in dimetric prisms, having a lustrous metallic appearance and reddish-brown colour. The purest specimens of this mineral contain about 98 per cent of titanic oxide. *Brookite* consists of titanic oxide, generally associated with from 3 to 4½ per cent of ferric oxide. *Anatase* is a greenish-yellow mineral, with adamantine lustre, occurring in quadratic octahedra, which are often much elongated. *Anatase* consists of nearly pure titanic oxide. *Sphene* is a silico-titanate of calcium, containing, on an average, 40 per cent of titanic oxide, with small quantities of oxides of iron, aluminium, and manganese. *Sphene* occurs in monoclinic crystals, the colour of which varies from gray to brown and black. *Titaniferous iron ores* contain quantities of oxides of iron and titanium, usually associated with oxides of manganese and magnesium.

Metallic titanium is a dark-gray, amorphous powder; it burns with great brilliancy in air, in oxygen, and in chlorine. This metal decomposes water only at high temperatures. The symbol of titanium is Ti, and the atomic weight 48.1. It has four oxides, three chlorides, and salts known as titanates.

**TITANS**, in Greek mythology, the sons and daughters of Uranus (Heaven) and Gæa (Earth). They were twelve in number, six sons and six daughters. They rose against Uranus and deposed him, raising Cronus, one of their number, to the throne. They were afterwards overcome by Zeus, and thrown into Tartarus.

**TITHES** (Anglo-Saxon, *tēotha*, a tenth part), the tenth part of the increase yearly arising from the

profits of lands, the stock upon lands, and the industry of the occupants, allotted to the clergy for their maintenance. The custom of giving and paying tithes is very ancient. In Gen. xiv. 20 Abraham gives Melchisedek the tenth of all the spoils taken from the four kings defeated by him. Tithes were first legally enjoined by Moses (Lev. xxvii., Deut. xiv., and elsewhere). They were not established by Christ. The Christian priests and the ministers of the altar lived at first upon the alms and oblations of the devout. The Council of Tours (567 A.D.) recommended that a portion of the fruits of the earth should be set apart for the clergy, a recommendation which was transformed into an order by the Council of Mâcon in 585; but as the order had not the sanction of the civil authorities it was of little effect. At length, in 778, Charlemagne established the payment of them within those portions of the old Roman Empire over which his sway extended, making that famous division of them into four parts: one to maintain the edifice of the church, the second to support the poor, the third the bishop, and the fourth the parochial clergy. Similar laws were soon afterwards enacted within the states of Western Europe. The first mention of them in any written English law appears to be in a constitutional decree made in a synod held in 786, wherein the payment of tithes is strongly enjoined. In 794 Offa, king of Mercia, made a law whereby he gave the church the tithes of all his kingdom, a law which was made general for all England by Ethelwulf. Upon the first introduction of tithes, though every man was obliged to pay tithes in general, yet he might give them to what priests he pleased, which were called *arbitrary consecrations of tithes*; or he might pay them into the hands of the bishop, who distributed among his diocesan clergy the revenues of the church, which were then in common. But when dioceses were divided into parishes the tithes of each parish were allotted to its own particular minister—first by common consent or the appointments of lords of the manors, and afterwards (about 1200) by the written law of the land. It is now universally held that tithes are due, of common right, to the parson of the parish, unless there be a special exemption. This parson of the parish may be either the actual incumbent or else the appropriator of the benefice—appropriations being a method of endowing monasteries which seems to have been devised by the regular clergy by way of substitution to arbitrary consecrations of tithes. (See the article *IMPROPRIATIONS*.) Tithes are, or rather were, of three kinds: 1, *predial*, those which arise immediately from the soil itself, as corn, hay, fruits, wood, &c; 2, *mixed*, those consisting of natural products, but nurtured and preserved by the care of man, as calves, lambs, pigs, colts, chickens, wool, milk, eggs, &c.; 3, *personal*, those arising from the profits of personal industry in the pursuit of a trade, profession, or occupation. With regard to their value tithes are divided into *great* and *small*. Great tithes are chiefly corn, hay, and wood, and belong to the rector; small tithes are all the other predial tithes, together with mixed and personal tithes, and belong to the vicar. By the original law all the land of the kingdom was tithable except crown and church lands; but when, at the Reformation, the estates of the abolished monasteries were granted mostly to laymen, these lands would have become tithable again but for the statute of 31 Hen. VIII. cap. xiii., which was enacted in favour of the new proprietors. The owners of the land, by the payment of a lump sum or by the grant of lands to the parson, redeemed the impost either for a time or for ever, in which case the land so redeemed was discharged from these payments,

temporarily or permanently; but the statute 13 Eliz. x. limited all such compositions to a period of three lives or twenty-one years. The circumstance that tithes were exacted from persons who did not belong to the church established by law, and the difficulties that lay in the way of collecting the tithes, led to constant bickerings between the clergy and the people. The impost was felt to be odious all over the country, and in Ireland the payment could not be enforced in great part of three of the four provinces. The public voice loudly demanded a measure of commutation, which was last met by the act 6 and 7 Will. IV. cap. xvii. This act, amended by subsequent statutes, provides for the conversion of all the uncommuted tithes in England and Wales into a corn and rent charge, payable in money, according to the value of a fixed quantity of corn, as ascertained from year to year by the average price of corn for the seven years ending at the preceding Christmas. For effecting a commutation two methods are provided: 1, by parochial agreement, voluntary on the part of a majority of persons having two-thirds interest in the land and tithes, but binding on the minority if not appealed against, or if no sufficient cause of objection is shown; 2, by compulsory award, which must be regulated and effected under the central board of commissions appointed to superintend the execution of the act. In Ireland the tithes were commuted into a money rent-charge, regulated by a valuation of the tithes (a fourth being deducted for the expenses of collection), and payable by the landowners, who should receive it from the occupiers. By the 32 and 33 Vict. cap. xlii. (the Irish Church Act) this rent-charge was vested in the commissioners of church temporalities, with power to sell such rent-charge to the proprietor charged therewith at 22½ years' purchase. Such purchaser may redeem the rent-charge by paying by instalments for fifty-two years at the rate of 4½ per cent. of the purchase-money, deducting the estimated charge for poor rate. The tithes in Scotland are called *teinds*.

**TITLING**, an ancient subdivision of the English population, said to have been made by King Alfred, and consisting of a company of ten householders and their families held together in a society, all being bound for the peaceable behaviour of each other, the chief of whom was the tithing-man (*teotlung-man*), whose duties are now fulfilled by the police constable.

**TITIAN**, or **TIZIANO VECELLIO**, one of the most distinguished of the great Italian painters, and head of the Venetian school, was born at Capo del Cadore, in the Alps of Friuli, in 1477, or, as some rather think, about 1489-90. His early studies were under Sebastiano Zuccati of Treviso, and subsequently under Giovanni Bellini of Venice, and he had as a fellow pupil Giorgione. The first important work of Titian was the completion in 1512 of the unfinished picture by Giovanni Bellini, The Homage of Frederick Barbarossa to Pope Alexander III., in the Sala del Gran Consiglio at Venice. The senate, who had selected the young painter to finish his late master's work, were so pleased with its execution that they appointed him to an office with 800 crowns a year; but the terms of the appointment bound him to paint for 8 crowns the portrait of every doge elected in his time. In 1514 he was employed at the court of Alphonso I., duke of Ferrara, where he became acquainted with Ariosto, whose portrait he painted. In 1516, shortly after his return to Venice, he painted an Assumption of the Virgin, considered one of the finest pictures in the world; it is now in the Academy of the Fine Arts in Venice. His now rapidly increasing renown procured him invitations to Rome by Leo X. and to Paris by Francis I., neither of which he accepted. In 1528, or perhaps

a year or two later, he produced his magnificent picture, *The Death of St. Peter the Martyr*—‘a painting,’ says Algarotti, ‘in which the great masters admitted they could not find a fault.’ About this time he was introduced by his friend the poet Aretino to the notice and patronage of the Emperor Charles V. In 1580 Charles invited him to Bologna to paint his portrait and execute various other commissions. The emperor was so well pleased with the artist that when he revisited Bologna in 1582 Titian was sent for to paint his portrait a second time. It is said that he accompanied Charles to Madrid, where he was created a count palatine of the empire and a knight of St. Iago, and that he remained three years in Spain, in which country many of his master-pieces, such as *The Sleeping Venus*, *Christ in the Garden*, *St. Margaret and the Dragon*, are still to be found. In 1587 he painted an *Annunciation* for the church of Santa Maria degli Angeli at Murano, but on being refused the price demanded (500 crowns) he presented the picture to the Empress Isabella, who sent four times that amount in return. In 1541 he produced *The Descent of the Holy Ghost on the Apostles*, *The Sacrifice of Abraham*, *David and Goliath*; and in 1548 he painted, at the request of the Venetian senate, his picture of *The Virgin and San Tiziano*. In 1545 he visited Rome, where he painted the famous group of Pope Paul III., the Cardinal Farnese, and Duke Ottavio Farnese. In 1547, and again in 1550, he was invited by his great patron and admirer, Charles V., to Augsburg. Philip II. continued the pension his father had granted to the renowned painter. Of Titian's private life but little is known. His favourite residence was at Venice, where, after his position in the world of art was secure, he lived in great splendour. He died of the plague in 1576. Titian may be regarded as the master of portrait-painting as relates to character, resemblance, grace, and tasteful costume. He excelled in the figures of women and children, but was not so successful with male forms. He was an exquisite colourist, but his correctness in drawing is less conspicuous. He was particularly remarkable for his accurate observation and faithful imitation of nature, whether in the figure, the landscape, the drapery, or other accessories. See *Titian: His Life and Times* (1879), by Crowe and Cavalcaselle.

**TITICACA**, the largest lake of S. America, on the south-east frontier of Peru and the western frontier of Bolivia, in the centre of an alpine valley between two great cordilleras of the Andes; area, roughly estimated at about 3300 square miles; height above sea-level, 12,200 feet. It is of very irregular shape, and contains several islands. Its outlet is the *Desaguadero*, which conveys its waters to Lake Aullagas in Bolivia. The lake contains an abundant supply of fish. Steamers have been put upon the lake, and Puno and Juli, on its western shore, are connected by rail with the Pacific coast and with some inland towns. According to legend the Inca dynasty originated on the islands of the lake.

**TITLARK**. See **PIPER**.

**TITLE-DEEDS**, in law, are the documentary evidences of ownership of real property, and consist of any deed, map, paper, or parchment, written or printed, or partly written and partly printed, being or containing evidence of the title or any part of the title to any real estate, or to any interest in or out of real estate. It is assumed that every owner has possession of his title-deeds either by himself or his agents.

**TITLES OF HONOUR**, appellations given to certain persons in virtue of particular offices or dignities possessed by them. They were but sparingly used by the Greeks, and were bestowed by the

Romans chiefly on men who had gained particular distinction in certain offices, in which case the designation became hereditary; such were the titles *Magnus* and *Africanus*, which were borne by the descendants of Pompey and Scipio respectively. Other offices carried their titles with them independent of the merits or services of the holders; and the epithets *Cæsar*, the name of a family, *Augustus*, and *pater patriæ* were gradually applied to all who filled the imperial throne. Towards the decline of the empire the emperors were styled divinities, were addressed as *Your Perpetuity* or *Your Eternity*, and in the provinces temples were erected to them even during their lifetime. In England Henry IV. had the title of *Grace*, Edward IV. that of *Most High and Mighty Prince*, Henry VII. that of *Highness*. Henry VIII. was addressed as *Majesty* by Francis I. of France during their interview at the Field of the Cloth of Gold in 1520. This title had, however, been previously assumed by the emperors of Germany, who considered themselves as successors of the Roman emperors. It was subsequently adopted by the sovereigns of Europe, whether emperor, czar, or king. James I. was styled *His Sacred Majesty* of England, and addressed in the dedication of the Authorized Version of the Bible as *James*, by the grace of God, *King of Great Britain, France, and Ireland, Defender of the Faith, &c.* Certain Catholic sovereigns prefix to the title of *majesty*, common to them all, a qualifying epithet, such as *Catholic* for Spain, *Most Faithful* for Portugal, *Apostolic* for Hungary, and *Most Christian* for the Bourbon kings of France. The reigning sovereign of Britain is styled *Edward VII.*, by the grace of God, of the United Kingdom of Great Britain and Ireland and of the British Dominions beyond the Seas *King, Defender of the Faith, Emperor of India*. The eldest son of the British sovereign is styled *Prince of Wales*, and the eldest daughter *Princess Royal*; the other sons and daughters are styled *Prince* and *Princess*, and all, together with the children of the sons of the reigning sovereign, are addressed as *Royal Highness*. The five orders of nobility in Britain are distinguished by the titles of honour—*Duke, Marquis, Earl, Viscount, and Baron*. These nobles have several titles, granted by distinct patents, in their progressive steps in the peerage. A duke may thus be a *Marquis, an Earl, a Viscount, and a Baron*; the Duke of Sutherland is, for instance, *Marquis of Stafford, Earl Gower, and Viscount Trentham, Baron Gower, Earl of Sutherland and Baron Strathnaver, and a Baronet*. A *marquis* may be at the same time an *Earl, Viscount, &c.*, and an *earl* a *Baron*, and so on. One of the inferior titles is permitted as a matter of social dignity to be assumed by the eldest son. Thus the eldest son of the Duke of Sutherland takes the courtesy title, as it is called, of *Marquis of Stafford*; the eldest son of the *Marquis of Ormonde* is the *Earl of Ossory*; the eldest son of the *Earl of Derby* is *Lord Stanley*. In Scotland the eldest son of a *baron* or *viscount* takes the courtesy title of *Master*; thus the eldest son of *Lord Lovat* is the *Master of Lovat*. Courtesy titles do not raise their bearers above the rank of commoners, and consequently the eldest sons of peers are eligible for election as members of the House of Commons. The lowest hereditary title is that of *Baronet*, which, besides its name, which is placed after the name and surname of its bearer, entitles him to the prefix *Sir*. The dignity of *knighthood* is not hereditary. The titles of *Esquire* and *Master* (Mr.) are now given indiscriminately to nearly all classes of persons. The continental titles of *Duke, Marquis, Count, Viscount, and Baron* often differ considerably in rank from the apparently corresponding titles in England.

**TITLING.** See **PITR.**

**TITMOUSE**, the name given to a large number of insectivorous birds, included in the section *Dentirostræ*, and in the sub-family *Parinæ*. In this latter group the bill is straight and short, with the nostrils opening at its base; the wings are of moderate size, and pointed; the tail is rounded and even; the tarsi are scaly in front; the inner toe is shorter than the other digits, and the claws are curved and strong. The genus *Parus* includes the most familiar and typical birds of this name. They are insect-feeders, but appear to be especially fond of the fat of meat. The Great Titmouse (*P. major*, see Plate III. at ORNITHOLOGY) inhabits England and Europe generally. In average length this bird measures between 5 and 6 inches. The head and throat are of purple colour; a spot of white exists under each eye, and also on the nape of the neck; the back is dark green, and the greater wing-coverts blue-black; the under parts exhibit a yellowish tint. The nest is built of moss, feathers, and hair, and is generally placed in the hollows of trees. The eggs vary in number from eight to twelve. The food consists of insects, or even of carrion. The Blue Titmouse (*P. cæruleus*) also occurs as a familiar British bird, and is so named from the blue tints of its plumage. Its food appears to consist in greater part of insect larvae, and it thus renders great service to gardeners by removing and destroying many of their insect pests. The Long-tailed Titmouse (*P. caudatus*), also known as the 'Bottle Tit,' &c., attains a length of 5 or 5½ inches, and is easily distinguished by the length of the tail. The eggs may number as many as twelve or sixteen; and the nest, built of moss and wool, is commonly constructed resembling an egg in form, and being covered externally with moss and lichens to render it inconspicuous. The Crested Titmouse (*P. cristatus*) derives its name from the crest of feathers borne by the head. It is rare in England, but common on the Continent. The Cole Titmouse (*P. ater*), so named from its dark-coloured plumage, is common in Britain. It has a length of between 4 and 5 inches, and is coloured black, with white patches on the neck and cheeks; the breast is white, and the belly pale fawn. The Marsh Titmouse is another familiar species, inhabiting marshy situations, and resembling closely in appearance the Cole Tit, but wanting the white spot on the nape of the neck. The Bearded Titmouse belongs to the genus *Paroides*, and is named *P. biarmicus* (see ORNITHOLOGY, Plate III.). It inhabits the neighbourhood of rivers and lakes, feeding on the seeds of grasses and sedges, but also eating insects and Mollusca. It is comparatively rare in England, but is common on the Continent, especially in Holland. The 'beard' is a tuft of black feathers depending from the sides of the head.

**TITRATION**, a term used in chemical analysis to denote the process by which the strength of a standard solution is determined by running in another liquid from a measuring vessel until saturation is complete. Thus the exact strength (that is, the quantity of true acid in a given volume) of standard sulphuric acid is determined by titrating with caustic soda solution—that is, by adding caustic soda solution, of known strength, until the liquid shows a neutral reaction.

**TITTHREL.** See **WHIMBREL.**

**TITUS**, or in full, **TITUS FLAVIUS SABINUS VESPASIANUS**, a Roman emperor, born A.D. 40, was the eldest son of the Emperor Vespasian. He was educated at the court of Nero with Britannicus, whose intimate friend he was. Titus served with credit as a military tribune in Germany and Britain, and after holding the quaestorship he accompanied his father in the war against the Jews as commander of a legion. When Vespasian was proclaimed emperor (69) Titus

was left to conduct the war in Judæa. He took Jerusalem (A.D. 70) after a siege, during which it had been the scene of the most shocking sufferings and cruelties. After paying a visit to Egypt he returned to Rome, which he entered in triumph, and was associated by his father in the government of the empire. He became sole emperor in 79, and though his life had hitherto been one of debauchery, he now showed himself as the enlightened and munificent sovereign of a vast empire. All informers were banished from his court, and even severely punished; a reform took place in judicial proceedings; and the public edifices were repaired, and new ones erected for the convenience of the people. He completed the Colosseum, which had been begun by his father, and also the baths called by his own name. During his reign there was a conflagration at Rome, which lasted three days; the towns of Campania were desolated by an eruption of Vesuvius (see **HERCULANEUM** and **POMPEII**); and the empire was visited by a destroying pestilence. In this season of public calamity the emperor's benevolence and philanthropy were most conspicuously displayed, and he spent money with the most lavish hand for the benefit of the sufferers. The Romans did not long enjoy the benefits of his wise and virtuous administration, the emperor having died on the 13th September, 81, in the forty-first year of his age, after a reign of a little more than two years and two months. His brother Domitian was strongly suspected of having poisoned him in order to make way for his own elevation to imperial power.

**TITUS, EPISTLE TO**, one of the three pastoral epistles (the remaining two being those addressed to Timothy), was written by St. Paul after his first imprisonment at Rome, and while he was staying at Nicopolis, not the city of that name in Macedonia, as the subscription has it, as this city seems to have been built by Trajan after the death of the apostle, but probably, as Jerome suggests, Nicopolis in Epirus. It is closely associated with the two epistles to Timothy, and like them is almost certainly not of Pauline authorship. (See **TIMOTHY, EPISTLES TO**.) The topics handled are the same as we find in the other two kindred epistles. See the Commentaries of Chrysostom, Theodoret, Jerome, Luther, Melancthon, Calvin, De Wette, Alford, Wace, Weiss, &c., and Holtzmann's work on the pastoral epistles.

**TIUMEN**, a town of the Russian Empire, in Western Siberia, in the government of Tobolsk, and 125 miles south-west of the city of that name, on the Tura, an affluent of the Tobol. It is an ancient place, which figures much in the early history of the country. As the principal seat of the Western Siberian traffic it carries on a very extensive trade. Its chief manufactures are leather, soap, candles, pottery, carpets, and woollens. Pop. (1897), 29,588.

**TIVERTON**, a municipal borough and market town of England, in Devonshire, on the river Exe, 13 miles north of Exeter, on a branch of the Great Western Railway. The main part of the town is situated on a height on the left bank of the river, and communicates with the suburb of West Exe by a stone bridge. Its buildings and institutions include: a Perpendicular church (restored), on the site of an older building; other Anglican churches; a Roman Catholic and several Nonconformist chapels; a seventeenth-century grammar-school, reorganized in 1876; a school of science and art; a town-hall; a drill and public hall; a market-house; a police-station; alms-houses; and a public park. The lace manufacture is the staple, but brewing and flour-milling are also carried on. Tiverton ceased to be a parliamentary borough in 1885. Pop. in 1891, 10,892; in 1901, 10,382.

**TIVOLI** (the ancient *Tibur*), a town of Central Italy, 17 miles N.W. of Rome, on the left bank of the Teverone, on the slope of Monte Ripoli, about 850 feet above the sea, commanding a fine view of Rome and its environs. It has steep, narrow, and ill-paved streets, and houses in general poorly built; with a modern handsome cathedral and some other churches. It is rich in ancient remains; among them may be mentioned the temple of the Tiburtine sybil, a beautiful circular building surrounded by Corinthian columns of stuccoed travertine, and adjoining it the Temple of Vesta, now converted into a church. In the vicinity are the remains of the magnificent villa of Hadrian, in which many valuable specimens of art have been found. The villa was destroyed by the Goth Totila. One of the chief attractions of Tivoli is a series of fine artificial cascades formed by the Teverone. Neither the trade nor the manufactures are of any consequence. Both the climate and the inhabitants have a bad name. Pop. 7000. Tibur was one of the oldest towns of Latium. It was one of the chief towns of the Latin confederation, and became subject to Rome on the final subjugation of Latium, 338 B.C. Under the Romans it continued to be a large and flourishing town, and many of the Roman nobles had villas in the neighbourhood.

**TIZIANO.** See **TITIAN**.

**TLAXCALA**, a state of the Mexican Republic, surrounded on all sides by the state of Puebla, except on the north-west, where it touches the frontiers of the state of Mexico; area, 1620 sq. miles; pop. (in 1900), 172,217. The capital, which bears the same name, is situated on the Atoyaca, about 70 miles east by south of the city of Mexico. It is famous in Mexican history, and was once an important city, containing at the time of the Spanish conquest 20,000 families. It is now an unimportant place, the population in 1900 being 2874.

**TLEMECEN**, a town of Algeria, in the province of Oran, and 70 miles S.W. of the city of that name, the chief military station of the French in the west of Algeria. It is surrounded by a wall with nine gates, and consists properly of three quarters, one containing the citadel and most of the military establishment; a second in the centre, allotted chiefly to business, and mostly inhabited by Europeans and Jews; and a third, forming the native town properly so called. Its manufactures consist of burnouses and other textile fabrics, leather, carpets, &c.; and there is an extensive trade, the desert furnishing ostrich-feathers, wool, and ivory in exchange for groceries and manufactured goods. Its pop. in 1886 was 19,745; in 1896, 32,978.

**TOAD**, the name applied to various genera of amphibian Vertebrata belonging to the order Anoura and family Bufonidae of that class, and distinguished as a family by the toes of the hind feet being slightly webbed, but not so perfectly as in the allied Frogs (which see). A well-developed tongue exists, but no teeth are developed. The hind legs also are not so disproportionately long as in the Frogs, and the tongue is fixed to the front of the mouth as in the Frogs, but is free posteriorly, this latter extremity being protrusible. The toes of the front limbs are not connected by a web. The skin is very prominently provided with warty tubercles and glandular bodies, and parotid glands (borne on the sides of the head) are developed. To this family of Amphibians belongs a great variety of species, all, of course, distinguished, as Amphibians, by passing through a metamorphosis, in which the young appears first as a tadpole, breathing by outside and then by internal gills; and finally, after losing its tail and developing lungs, leaving the water and appearing in its adult state as a terrestrial

and lung-breathing form. In the typical genus *Bufo*, to which the Common Toad (*B. vulgaris*), Natterjack (which see, *B. calamita*), and the Egg-carrying or Accoucheur Toad (*B. obstetricans*) belong, the head is flattened above, the muzzle being usually obtuse, and the skin on the sides of the head smooth. The members of this genus occur in every quarter of the globe but Australia. The Toads visit the water in March or April, their breeding season, for the purpose of depositing their eggs, which are deposited in long strings; the male drawing the eggs out of the female's body. The food consists of insects and worms. The popular repugnance to these perfectly harmless animals has no doubt arisen from their unprepossessing aspect and outward appearance. No venom or poison apparatus of any kind exists in these creatures; and save that the secretions of the skin may be of acrid or irritant nature when brought in contact with cut or exposed surfaces, they are utterly harmless in every way. The male Accoucheur Toad attaches the eggs to his thighs by glutinous matter, and carries them until the eyes of the tadpole appear through the envelope, after which they are deposited in water. The Green Toad (*B. viridis*) is common in the south of France; and in a species known as the Warty Toad (*B. tuberous*) the warty nature of the skin is especially developed. The Pípidas or Surinam Toads are described in the article PIPA. The Fire-bellied Frog or Toad (*Bombinator igneus*) is a small continental species grayish or brown above, black blue with orange spots beneath. (See AMPHIBIA, &c.) The Tree-toads belong to the genera *Hyla* and *Tra-chycephalus*. See the plate at BATRACHIANS.

Reports of toads having been found immured in *solid* rocks, where they must have remained for ages, and yet hopping about lively and well on being released, are published year by year. Yet obvious objections to their reception, apart from common-sense scruples, may be found, firstly, in the fact that no evidence that the rock was *solid* is ever adduced; secondly, that the relaters of such tales are usually uneducated persons, often imbued with superstitious ideas; and, thirdly, the possibility of these creatures, in their young state, gaining admittance through cracks or crevices to holes in rocks, and there subsisting on insects, &c., whilst their increasing growth prevents their escape from the cavity in which they are found on the rock being broken up. Experiments made by Dr. Buckland tend to prove that, when excluded from air and food, frogs and toads, in virtue of their slow circulation and cold-blooded habits, might survive about a year or eighteen months at most.

**TOAD-FISH**, a name applied to the Eagle Ray. See RAY.

**TOAD-FLAX**, the name given to a genus of plants of the natural order Scrophularineæ, which, from their having some resemblance to flax (*Linum*), have given rise to the generic name *Linaria*. They have a personate corolla, with spurred tube, upper lip erect, lower with mid-lobe smallest, palate sometimes closing the throat; flowers sometimes regular (*Peloria*), with five spurs and lobes to the corolla, and five stamens. *L. Cymbalaria* is the Ivy-leaved Toad-flax, often found trailing over old walls. *L. vulgaris*, the most common and familiar species, has yellow flowers, produced on a stem 1 or 2 feet high. The spur of the corolla is short. It is a reputed purgative and diuretic. Allied to this genus is the Antirrhinum (which see).

**TOBACCO** (*Nicotiana tabacum*), a very important plant, belonging to the natural order Atropaceæ, or night-shade order. The introduction of the use of tobacco forms a singular chapter in the history of mankind. According to some authorities smoking was practised by the Chinese long before the adven-

turous seamen of Europe had found their way across the Atlantic, but the custom does not seem to have extended over the surrounding countries until a much more recent period. At the time of the discovery of America tobacco was in frequent use among the Indians, and the practice of smoking, which had with them a religious character, was common to almost all the tribes (see CALUMET), and they pretended to cure a great variety of diseases by this plant.

The name *tobacco* was either derived from the term used in the Haytian language to designate the pipe, or from the province of Tabaca in St. Domingo, whence it was first introduced into Europe in 1559 by a Spanish gentleman named Hernandez de Toledo, who brought a small quantity into Spain and Portugal. From thence, by means of the French ambassador at Lisbon, Jean Nicot, from whom it derived its generic name, it found its way to Paris, where it was used in the form of a powder by Catharine de' Medici. Tobacco then came under the patronage of the Cardinal Santa Croce, the pope's nuncio, who, returning from his embassy at the Spanish and Portuguese courts, carried the plant to his own country. Both in France and in the Papal States it was at once received with general enthusiasm in the shape of snuff, but it was some time after the use of tobacco as snuff that the practice of smoking it commenced. This practice is generally supposed to have been introduced into England by Sir Walter Raleigh; but Camden says, in his Elizabeth, that Sir Francis Drake and his companions, on their return from Virginia in 1585, were the first who introduced the habit of smoking tobacco into England. After a time the practice of smoking tobacco met with strenuous opposition in high places, both in this country and other parts of Europe. Its principal opponents were the priests, the physicians, and the sovereign princes; by the former its use was declared sinful, and in 1684 Pope Urban VIII. published a bull excommunicating all persons found guilty of taking snuff when in church. This bull was renewed in 1690 by Pope Innocent, and about twenty-nine years afterwards the Sultan Amurath IV. made smoking a capital offence. For a long time smoking was forbidden in Russia, under pain of having the nose cut off; and in some parts of Switzerland it was likewise made a subject of public prosecution, the police regulations of the canton of Bern in 1661 placing the prohibition of smoking in the list of the Ten Commandments, immediately under that against adultery. Nay, James I. of England did not think it beneath the royal dignity to take up his pen upon the subject, and in 1603 published his famous Counterblaste to Tobacco. But notwithstanding this regal and priestly wrath the use of the plant extended itself far and wide, and tobacco is at this moment perhaps the most general luxury in existence.

The plant (*Nicotiana tabacum*) is glutinous, and covered with a very short down; the stem upright, 4 or 5 feet high, and branching; the leaves are alternate, sessile, oval-oblong, and entire on the margin, the superior ones lanceolate; the flowers are disposed in a terminal panicle; the tube of the corolla is long, inflated towards the summit, and dividing into five acute, angular, spreading lobes, of a rose colour. It was originally a native of South America. Another species (*N. rustica*), cultivated in various parts of the world, is distinguished by the short yellowish-green corolla. The best Havana cigars are said to be made from the leaves of *N. repanda*. Other species of tobacco are found in Mexico and South America. The Persian tobacco (*N. Persica*) is a species that yields an excellent leaf. One species has been discovered in China, and another in Australia.

Tobacco owes its principal properties to the presence of an alkaloid named nicotine (see NICOTINE), which is a most energetic poison, and to some extent to a volatile oil (nicotianin) and an empyreumatic oil. Tobacco has been employed in medicine as a local stimulant, and as a sedative, antispasmodic, emetic, laxative, and diuretic. When chewed it appears to impair the appetite and induce torpor of the gastric nerves. 'Although (says Lindley) if smoked in moderate quantities, it acts as a harmless excitant and sedative, yet it is a frequent cause of paralysis when the practice is indulged in to excess. Oil of tobacco, which is inhaled and swallowed in the process of smoking, is one of the most violent of tobacco poisons.'

As tobacco is cultivated for the leaves, it is an object to render these as large and as numerous as possible, and new, fresh, and fertile soil is preferred. It is very sensible to frost. The plants are raised on beds early in spring, and when they have acquired four leaves they are planted in the fields in well prepared earth, about 3 feet distant every way. Every morning and evening the plants require to be looked over, in order to destroy a worm which sometimes invades the bud. When 4 or 5 inches high they are moulded up. As soon as they have eight or nine leaves, and are ready to put forth a stalk, the top is nipped off, in order to prevent flowering, and to make the leaves larger and thicker. After this the buds, which sprout from the axils of the leaves, are all plucked; and not a day is suffered to pass without examining the leaves, to destroy a large caterpillar which is sometimes very destructive to them. When they are fit for cutting, which is known by the brittleness of the leaves, they are cut with a knife close to the ground, and after lying some time are carried to the drying-shed, where the plants are hung up upon lines, having a space between, that they may not touch one another. In this state they remain to sweat and dry. When perfectly dry the leaves are stripped from the stalks, all bad ones are rejected, and the good ones are made into small bundles. These bundles are laid in heaps, and covered with blankets. Care is taken not to overheat them, for which reason the heaps are laid open to the air from time to time, and spread abroad. This operation is repeated till no more heat is perceived in the heaps, and the tobacco is then stowed in casks for exportation.

In the manufacture of tobacco the leaves are first cleansed of any earth, dirt, or decayed parts; next they are gently moistened with salt and water, or water in which salt has been dissolved; this liquor is called tobacco sauce, and is useful chiefly in moderating the fermentation which generates free ammonia in the leaves, and preventing them from passing into the putrefactive stage. Sea-salt, which contains chloride of lime, tends to keep the tobacco moist, and is preferable to pure chloride of sodium for this purpose. Some manufacturers mix with this sauce various ingredients, such as molasses, a solution of extract of liquorice, &c. The next operation is to remove the midrib of the leaf; the leaves are then sorted anew, and the large ones set apart for making cigars. Most of the tobaccos used by British smokers are mixtures of different growths; one kind, for instance, consists of 70 parts of Maryland growth and 30 of meagre Virginian. The Maryland is a very light tobacco, with thin yellow leaves; that of Virginia is in large brown leaves, unctuous or somewhat gluey on the surface; that of Havannah is in brownish light leaves of an agreeable and rather spicy smell; it makes the best cigars. That of Carolina is less unctuous than the Virginian, and in the United States ranks next to the Maryland. The leaves are



out finely by knife-edged chopping-stamps, so as to be convenient for use in pipes, as is the case with *shag* tobacco, which is dried to the proper point on sheets of copper; or they are moistened with an infusion of tobacco-stalks and other waste parts, and laid evenly over each other, and pressed by powerful machines into cakes of about 9 inches long by 3 broad, which take the name of *cavendish*; or they are formed by pressure into sticks of about an inch thick, to which the name of *negrohead* is applied; or again, the leaves may be spun by a wheel in the form of a rope of more or less thickness; the smallest twist, which is about the thickness of a goose-quill, is called *pig-tail*, and is chiefly used by tobacco-chewers. The midribs separated in the first part of the manufacturing process may be converted into snuff. (See SNUFF.) Cigars and cheroots are favourite forms of manufactured tobacco. As the best leaf is grown in Cuba, so also are the best cigars made there, and the demand so far exceeds the supply that scarcely any competition exists among the manufacturers. (See CUBA.) Mexico also produces excellent tobacco. The leaf used for the manufacture of Manilla cheroots is grown chiefly on the Island of Luzon, and is considered nearly equal to that of Cuba. France, Germany, Italy, and other European countries produce considerable quantities, generally as a government monopoly. European and Asiatic Turkey, India, Burma, Java, &c., all contribute to the supply of the weed. In Germany, Holland, and Belgium immense quantities of cigars made of inferior tobacco are manufactured, and shipped to almost every foreign port at low prices. Cigarettes are another form in which tobacco is consumed to a great and increasing extent.

In Britain the duty on tobacco is higher in proportion to the intrinsic value of the article than that imposed on any other import. The value of the best leaf ranges from 3d. to 9d. per lb., and the duty on manufactured tobacco is 3s. 0d. per lb. if containing 10 per cent or more of natural moisture, or 3s. 4d. if containing less than 10 per cent. On manufactured tobaccos the duties are: on cavendish or negrohead, 4s. 4d.; on the same manufactured in bond and other manufactured tobacco except cigars, 3s. 10d.; on cigars, 5s. 6d. The imports of tobacco into the United Kingdom in 1901 were as follows: Unmanufactured, 84,396,819 lbs. (largely from the United States), of which 5,124,283 lbs. were re-exported; cigars, 2,940,780 lbs., of which 352,965 lbs. were re-exported; manufactured of other sorts, 4,470,895 lbs., of which 1,053,141 lbs. were re-exported. The total value of tobacco imports was £4,745,888. The total amount of duty received was £12,073,852. The annual consumption per head of the population is now about 40·8 ounces.

TOBACCO-PIPE. See PIPE (TOBACCO).

TOBAGO, an island of the British West Indies, belonging to the Windward group, 22 miles north-east of Trinidad; 26 miles long by 7½ broad; area, 73,313 acres. It rises with a steep ascent on the north-east to the height of about 1800 feet, and descends towards the south-west, with some small but picturesque valleys intervening. It is well watered by rivulets and streams, and the climate is healthy. Two-thirds of the area are occupied by primeval forests, but several of the plains and valleys are remarkably fertile. The produce consists chiefly of sugar, molasses, rum, cocoa-nuts, &c. The island is now governed as a ward of the united colony of Trinidad and Tobago. Tobago was discovered by Columbus in 1498, and after various vicissitudes was finally ceded to Britain by France in 1814. Principal town, Scarborough, on the south coast. Tobago appears to be the island that Defoe

had in view in his Robinson Crusoe. Pop. (1891), 18,353; (1901), 18,750.

TOBIT, Book of, one of the Old Testament books rejected as apocryphal by the Jews and Protestants, but received into the canon by the Roman Catholics. It contains an account of some remarkable events in the life of Tobit, a Jew carried captive to Nineveh, and his son, who is named Tobias. Ewald ascribes the book to a Palestinian Jew who wrote in Hebrew, and suggests as the date of its composition the middle of the fourth century before Christ; it is almost certainly not later than the first century A.D. The earliest known text is in Greek. The book bears a strong likeness to the tales of the Thousand and One Nights, with the obvious exception that the writer has a considerable acquaintance and sympathy with the Old Testament writings.

TOBOL, a river of Siberia, rises on the eastern slope of the Ural Mountains, in the province of Turgai, and joins the left bank of the Irtysh opposite the town of Tobolsk, after a course of about 550 miles. At Kurgan it is crossed by the Trans-Siberian Railway. Its chief tributary is the Tura.

TOBOLSK, a town of Western Siberia, capital of the government of Tobolsk and the see of a bishop, on the right bank of the Irtysh, at the confluence of the Tobol. The public buildings include a cathedral, a number of other churches, the governor's residence, the bishop's palace, the post-office, the council-house, the bazaar, the arsenal, barracks, hospital; a large prison, where the Siberian exiles are all assembled previous to being settled in various parts of the country; theatre, ecclesiastical seminary, gymnasium, &c. The manufactures include tallow, soap, bricks, &c.; the trade, once considerable, has greatly diminished. The upper town is fortified. Pop. (1897), 20,427. — The government comprises the north-western part of Siberia, and has an area of 564,825 square miles, and a population (1897) of 1,438,655. See SIBERIA.

TOCQUEVILLE, ALEXIS CHARLES HENRI CLÉREL DE, a distinguished French statesman and writer, was born at Verneuil on July 29, 1805, and originally destined for the military profession, but exchanged it for that of law. In 1827 he was appointed an assistant magistrate at Versailles. In 1831 he was commissioned by the French government to proceed, along with his friend M. Gustave de Beaumont, to America, and to investigate and report upon the penitentiary system of the United States. The results of the inquiry were published in 1833 under the title *Du Système Pénitentiaire aux États-Unis et de son Application en France*. This, however, was only the precursor of the greater and more celebrated work *La Démocratie en Amérique* (two vols., Paris, 1835), to which the Montyon prize of the French Academy was awarded in 1836, and which, by 1850, had run through thirteen editions. It presents a powerful analysis of democracy as exemplified in the institutions and political relations of the United States, and was translated into the principal European languages. M. de Tocqueville was in 1839 elected to a seat in the chamber of deputies, and ranged himself with the opposition. After the revolution of 1848 he was nominated deputy from the department of La Manche to the national assembly, where he voted always against the propositions of the ultra-democratic party. In the cabinet of June 2, 1849, he accepted the portfolio of foreign affairs, but resigned it the same year, after holding it for five months. After the *coup d'état* of December 2, 1851, he lived retired from public affairs, and devoted his leisure to the production of *L'Ancien Régime et la Révolution*, published in 1856. He died at Cannes on April 16, 1859.



**TODDY**, the name given by the English to the sweet juices which are extracted from the different species of the palm tribe, including the cocoa-nut tree. When newly drawn from the tree it is a sweet, cool, refreshing beverage, but when it has been allowed about ten or twelve hours to ferment it becomes highly intoxicating. The name toddy is also given to a mixture of whisky, hot water, and sugar.

**TODMORDEN**, a town of England, partly in Lancashire, partly in Yorkshire (West Riding), on the Calder, in a beautiful valley, on the Yorkshire and Lancashire Railway, 21 miles N.N.E. of Manchester. The principal buildings are Christ's and St. Mary's churches; Unitarian, Independent, Baptist, and Methodist chapels; the town-hall, free library, poor-law offices, and technical school; there are manufactures of cotton goods, also foundries and machine-works. Pop. (1891), 24,725; (1901), 25,419.

**TODY**, the term applied to a sub-family of Fissirostral birds known as the *Todinae*, which are distinguished by the long bill, with its tip sharp or rounded, by the exposed nostrils, by the wings being short and rounded, and by the tail being slightly forked. The tarsi are slender, and the outer toe is longer than the inner. In the typical genus *Todus* the edges of the bill are straight and finely notched. The quills, from the fourth to the sixth, are longest, and of equal size. The tarsi have a single long plate in front. The birds inhabit tropical America, and are represented by the Green Tody (*T. viridis*), a small bird about 4 inches in length, and coloured green of various hues on the upper parts, the flanks being rose-coloured, the throat scarlet, and the belly pale yellow. The under surfaces of the wings are naked. This bird appears to possess but limited powers of flight. The nest is generally placed in a hole in the bank of a river.

**TOGA** (from *tegere*, to cover), the principal outer garment of wool, which, in time of peace, Roman citizens wore in public. It was originally worn by both sexes, but when the *stola* came to be worn by the matrons it was only worn by females of bad character. Under the emperors the toga went out of fashion. The toga, which was of a semicircular shape, was thrown over the left shoulder and passed under the right arm, which thus remained entirely free. From the breast downwards it was sewed together, and as the Romans had no pockets, the hollow called *sinus*, in front of the breast, was used to put small articles in. The variety in the colour, the fineness of the wool, and the ornaments attached to it, indicated the rank of the citizen. Generally it was white.

**TOISE**. Previous to the introduction of the decimal system in France the toise was the unit of linear dimension; it was divided into 6 *pieds* (feet), each *pied* into 12 *pouces* (inches), and each *pouce* into 12 *lignes* (lines), and is equivalent to 1·94904 mètres, or 6·8945925 English feet.

**TOKAT**, a town in the north-west of Asia Minor, in the vilayet of Sivas, about 100 miles south-east of the Sea of Marmora. The houses are mostly built of mud-bricks dried in the sun, the streets narrow and filthy, and the bazaars, with one exception, are mean and ill-supplied. There are considerable manufactures. The population, once said to have reached 100,000, is now estimated at 35,000.

**TOKAY**, a town of Hungary, in the county of Semplin, at the conflux of the rivers Theiss and Bodrog; pop. 5000. This town is celebrated for its wine, which is esteemed the best of the wines of Hungary. It is the product of the country around the town called the Submontinedistrict, or Hegyallya, 20 or 30 miles in extent. The best Tokay is obtained from the vineyards on the little isolated hill called

*Mezős-Máli*. The grapes are never gathered until fully ripe, and great care is bestowed on their proper assortment and in the manufacture of the wine. Both sweet and dry wines are produced, and the best sort is obtained from the grapes when put into a cask without artificial pressure; this is called Tokay essence; the second sort, or Ausbruch, is obtained by applying a slight pressure; and the inferior qualities by the same amount of pressure that is required in the manufacture of ordinary kinds of wine. The average yearly produce amounts to 1,500,000 imperial gallons dry, and 50,000 gallons sweet wines, but it is held in such repute among the Hungarians themselves that very little of the genuine wine finds its way into foreign markets. Imitation Tokay is extensively made in France and Germany, and finds a ready sale in all parts of Europe—even in Hungary itself.

**TOKIO**. See *YEDDO*.

**TOLEDO** (anciently *Toletum*), a city of Spain, in New Castile, capital of a province of the same name, on the Tagus, 55 miles south-west of Madrid. It is the see of an archbishop, who is primate of Spain. The city is protected by walls, and is picturesquely situated on the sides of a steep hill, surrounded by lofty mountains, and the environs are rocky and unproductive. The streets are narrow and steep, and the houses crowded. The alcazar, or palace and fortress (completed in 1551), is placed in the most commanding site, and is the most striking feature of the city it once defended and now adorns. Toledo contains a Gothic cathedral, one of the grandest in the world. The manufactures consist of woollens, linens, silk, &c. The Toledo sword-blades, renowned for many centuries, are manufactured in a large building on the Tagus, about 2 miles from the town. The few blades that are still made are of exquisite temper and polish, and so elastic that they are sometimes sold in boxes curled up like the main-spring of a watch. Toledo is a place of great antiquity, having been taken by the Romans in 193 B.C. It is much celebrated in the history of Spain, and was successively the seat of government under the Goths, Moors, and kings of Castile. In the fourteenth century it had 200,000 inhabitants; the population is now (1887) 20,837.

**TOLEDO**, a flourishing city of Lucas county, Ohio, United States, pleasantly situated on a plain at the western extremity of Lake Erie, 4 miles from the mouth of the Maumee River, 65 miles S.W. of Detroit. The river affords a spacious harbour for the largest vessels. Toledo is the terminus of the Miami and Erie, and the Wabash and Erie Canals, and the centre of numerous railway lines, being a great seat of trade. The exports comprehend flour, grain, cattle, beef, pork, timber, coal, iron-ore, &c. There are numerous industries, including machine-shops, foundries, flour-mills, manufactories of tobacco, flax, cotton, &c. Pop. in 1870, 31,731; in 1880, 50,137; in 1890, 81,434; in 1900, 131,822.

**TOLENTINO** (anciently *Picenum*), a small town of Central Italy, in the province of Macerata, with a fine cathedral. Here Pope Pius VI., in 1797, concluded a humiliating peace with Bonaparte, and in the neighbourhood, in 1815, Murat, at the head of the Neapolitans, was defeated by the Austrians under Bianchi. Pop. 4205.

**TOLERATION**. See **RELIGIOUS LIBERTY**.

**TOLERATION, ACT OF**. See **ACT OF TOLERATION**.

**TOLL**. See **ROADS (PUBLIC)**.

**TOLLENS**, HENDRIK CORNELISZON, a celebrated Dutch poet, was born in Rotterdam in 1780. He early showed his inclination and genius for poetry, and his first work, *Romances and Idylls*, published in 1802, gave preface, notwithstanding many defects, of the future greatness of their author. In 1806 his poem on

the Death of Counts Egmont and Horn received for its vigour and harmony the prize offered by the Society for the Cultivation of the National Language and Poetry. A collection of his poems appeared in 1808, among which the Ode to a Fallen Girl is especially noticeable. Admirable of their kind, though in a different strain, are his *Wapenkreet* and *Vaderlandisch Krijgsged.* (1815). Tollens was now the favourite national poet of his countrymen. In addition to those already mentioned are: *Love Poems*; *De Overwintering der Hollanders op Nova Zembla*, a wonderful piece of descriptive poetry; *Romances, Ballads, and Legends* (1818-19); *Nieuwe Gedichten* (1821 and 1829); and *Volksliederen* (1833). He died at Rijswijk in 1856.

**TOLOSA**, a town of Spain, in the province of Guipúzcoa, 15 miles south of San Sebastian, on the Oria, here spanned by two magnificent bridges. The chief buildings are the church of Santa Maria, with a colossal figure of John the Baptist on the façade, and the *Palacio Idiazquez*. There are manufactures of paper, cast-iron, machinery, and fine cloths. Pop. (1887), 7239.

**TOLSTOI**, COUNT LYOF (LEO) NIKOLAIEVITCH, a distinguished Russian novelist, religious teacher, and social reformer, was born on the family estate of Yasnaya Polyana, in the government of Tula, on Sept. 9, 1828. He received his earlier education at home, and in 1843-46 studied oriental languages and law at the University of Kazan. In 1851 he went to the Caucasus district as an ensign of artillery, and he served in the defence of Sevastopol during the Crimean war. To this period of his career belong his earliest literary works, among them the autobiographical *Childhood, Boyhood, and Youth*, the brilliant descriptions of the Crimean campaign entitled *Sevastopol* in Dec. 1854, *Sevastopol* in May 1855, and *Sevastopol* in Aug. 1855, and *The Invasion*. He left the army on the conclusion of the war and went to St. Petersburg, where he made the acquaintance of Turgeneff and other distinguished Russians, and soon after he published *The Snowstorm* and *Two Hussars*. His first foreign journey was made in 1857, and marks an epoch in his spiritual history, and on his return he retired to his estate to live a simpler life. He was greatly interested in the condition of the peasantry, and founded a free village school on his property, for which he prepared reading and other text-books himself. His work entitled *Family Happiness* was issued in 1859, and was soon followed by *Three Deaths* (1859), *Polikuschka* (1860), and others. In 1862 he married the daughter of a Moscow physician. The next period of his life saw the production of the two works upon which his literary reputation chiefly rests, namely, *War and Peace* (1865-68), dealing with Napoleon's invasion of Russia; and *Anna Karenina* (1877), a powerfully realistic study of human passion and its effects. Soon after the completion of the latter novel Tolstoi began to develop his characteristic views of religion and its application to individual and social life. He believes that the Sermon on the Mount literally interpreted is the supreme law of the Christian life, and he lays special stress on the precept, Resist not evil. His system has much in common with the anarchist-communism of his fellow-countryman Kropotkin, but its peculiar religious basis gives it a unique character. In 1901 he was formally excommunicated by the Holy Synod of the Russian Orthodox Church, and in a reply to the edict of excommunication he clearly enunciated his religious and theological views. These include the denial of the Trinity, of the deity of Jesus and his vicarious atonement, of orthodox conceptions of the future

world, of every kind of sacramentalism, and similar dogmas, and are substantially identical with those of modern spiritual Unitarianism. Among the works of his latest period, in which his religious and social views are more or less expounded, are the following: *What the People Live By* (Eng. 1889); *What to Do* (Eng. 1889); *My Confession*; *My Religion*; *The Death of Joan Ilyitch* (1886); *Where Love is there God is also*; *The Kingdom of God is Within You*; *The Kreutzer Sonata* (1890); *Work While ye have the Light* (Eng. 1890), a tale of the early Christians; *The Power of Darkness*, a drama; *The Fruits of Enlightenment* (1891), a satirical comedy; *Master and Servant*; *Politics and Religion*; *Patriotism and Christianity* (1894), on the Franco-Russian alliance; and *What is Art?* (1898). *Resurrection* (1900) is a powerful novel of the same type as *Anna Karenina*. Tolstoi has given up all privileges of rank in order to live a life of labour and asceticism, and during the great Russian famine he found abundant opportunity for carrying out his gospel of social service.

**TOLTEKS**. See MEXICO—*Antiquities*.

**TOLUENE**, or **TOLUOL**. In the article NAPHTHA it has been pointed out that the lighter portions of coal-tar contain five hydrocarbons belonging to the benzene series, the second of which is toluene. This hydrocarbon is also called toluol; it is a colourless, very mobile, strongly-refracting liquid, which boils at 111° C. Toluene is obtained as a product of the distillation of most organic substances; it is also prepared artificially. Its formula is  $C_7H_8$ .

**TOMAHAWK**, the light battle-axe of the North American Indians. It was formerly a rudely-formed stone wedge attached to a wooden handle by strips of hide or animal sinews; latterly, the European traders furnished the natives with steel hatchets, the heads of which were hollowed out to serve as a tobacco-pipe—the ash handle, which was bored along its whole length, being the stem. To bury the hatchet or tomahawk signified among them to make peace.

**TOMATO**, or **LOVE-APPLE**, a plant and its fruit (*Lycopersicon esculentum* or *Solanum Lycopersicum*) belonging to the natural order Solanaceæ, closely related to the deadly nightshade, the henbane, and especially the potato. It is a native of South America, and was introduced into Europe in the sixteenth century, but it was not till last century that it obtained its present important position among articles of food. It is a weak-stemmed plant with interruptedly-pinnate leaves, yellow flowers resembling those of the potato, and a red or yellow fruit of a more or less globose shape. In 1901 Britain imported 793,995 cwts. of tomatoes, chiefly from the Canary Islands, Spain, the Channel Islands, and France, but a large proportion of the tomatoes consumed in Britain are home-grown. Under ordinary circumstances the climate of the United Kingdom is unfavourable to open-air cultivation, and consequently the usual method is to raise them under glass. The soil should be fairly rich, and should be warmed prior to use. A mixture of two parts fibrous or good yellow loam with one of horse-droppings only partially decayed, with some charred soil and a sprinkling of soot and superphosphate of lime, is a good compost. Excessive heat and moisture must be avoided; the most suitable temperature is about 55°, increasing to 60° or 65° in the daytime. They may be grown in pots, or in the ground over which the glass houses are built. For the details of management see the *Gardener's Assistant* (entirely new edn., 1902) and similar works. Tomato plants may be attacked by the potato-disease fungus (*Phytophthora infestans*), by yellow spot

(*Cladosporium fulvum*), by black stripe (*Macrosporium Lycopersici*), by sleeping disease (*Fusarium Lycopersici*), by alime fungus, by black rot (*Macrosporium Tomato*), and by some insect and other pests. Some of the finest varieties of the tomato are the following: Best of All, Champion, Dwarf Gem, Early Ruby, Frogmore Selected, Holmes' Supreme, Peachblow, Princess of Wales, Sunbeam, The Comet, Veitch's Glory, and Winter Beauty. The fruit is utilized in several different ways. It forms a principal ingredient of certain sauces; but is more valued as a salad. It is also cooked and served in various ways, and an excellent soup is made with it.

**TOMB.** See **SARCOPHAGUS**, **BURYING-PLACES**, and **FUNERAL RITES**.

**TOMLINSON, CHARLES**, writer on science, was born in London on Nov. 27, 1808. He early lost his father, and had to depend upon himself for his support. He was educated at the London Mechanics' Institute, and afterwards, while conducting a day-school near Salisbury along with his brother, he extended his knowledge of science by attending lectures at University College, London, and other educational institutions. He issued a Students' Manual of Natural Philosophy in 1838, and in 1845 was associated with W. A. Miller in bringing out a new and completed edition of Daniell's Meteorology. Soon afterwards he became lecturer on experimental science in King's College School. He was elected a fellow of the Royal Society in 1872, and he assisted in founding the Physical Society in 1874. In 1878-80 he was Dante lecturer at University College, London. He died at Highgate on Feb. 15, 1897. His numerous publications include: Amusements in Chess (1845); Introduction to the Study of Natural Philosophy (1848); Pneumatics (1848, fourth edn., 1887); Rudimentary Mechanics (1849; ninth edn., 1867); Warming and Ventilating (1850); Natural History of Common Salt (1850); Illustrations of the Useful Arts (1855-64); Illustrations of Trades (1860); The Useful Arts and Manufactures of Great Britain (1861); Experimental Essays (1863); On the Motions of Eugenic Acid on the Surface of Water (1864); Illustrations of Science (1867); The Sonnet (1874); Experiments on a Lump of Camphor (1876); The Literary History of the Divine Comedy (1879); Sonnets (1881); Essays, Old and New (1887); A Critical Examination of Goethe's Sonnets (1890); Dante, Beatrice, and the Divine Comedy (1894); and, as editor, a Cyclopædia of Useful Arts (1852-54).

**TOMSK**, a town of Western Siberia, capital of the government of Tomsk, on the right bank of the Tom, and on a branch of the Siberian railway. It consists partly of an upper town, built upon hilly ground, occupied by the Russians and better classes; and a lower town or suburb, inhabited by Tartars. The lower town consists of low but regular wooden houses, from amid which the slender towers of several mosques are seen to rise; the houses of the upper town are larger and of more imposing appearance. There is a new cathedral, a university (1885), several schools, a public library, &c. The manufactures consist of coarse cloth, leather, and soap; and an extensive trade is carried on in furs, fish, and cattle. Pop. (1897), 52,430.—The government of Tomsk has an area of about 830,000 square miles, and a population (1897) of 1,917,527.

**TON**, a denomination of weight equivalent to 20 hundredweights (contracted cwt.), or 2240 lbs. In some parts of Great Britain, as the mining district of Cornwall, the *long ton*, of 21 cwts., is used. In America goods are sometimes weighed by the short ton, of 2000 lbs.

**TONBRIDGE.** See **TUNBRIDGE**.

**STONE.** See **MUSIC** and **GREGORIAN TONES**.

**STONE, THEOBALD WOLFE**, a leader of the United Irishmen, was born in Dublin on June 20, 1768. He was educated in two Dublin schools, and entered Trinity College, where he graduated B.A. in 1786. In 1785 he eloped with the granddaughter of a wealthy clergyman, but he was soon reconciled to his wife's family, and his married life was happy. He became a student of the Middle Temple in 1787, and in 1789 he graduated LL.B. of Trinity College, Dublin. He practised law for a time without much success, and gradually politics became his absorbing interest. He held republican opinions, and believed that Ireland ought to assert her rights as an independent nation, but the objects of the clubs of United Irishmen started at Belfast and Dublin in 1791 were limited to legislative reform. In 1792 he was appointed secretary of the general Catholic committee, and he discharged the duties of this post with conspicuous ability. The government came to know through a spy that he had given information in 1794 on the question of invasion to an emissary of the French government, but they permitted him to leave the country and go to America. He sailed from New York to France in 1796, and urged the French government to undertake an invasion of Ireland. He was adjutant-general in Hoche's abortive expedition against Ireland in 1797, and he afterwards served under Hoche on land. He accompanied one of the small French expeditions sent to assist the Irish rebels in 1798, but was taken prisoner after a brief naval engagement near Lough Swilly. He was tried by court-martial at Dublin, convicted of treason, and ordered to be executed within forty-eight hours. An application for a writ of habeas corpus, made on the morning of the day fixed for the execution, was granted by Lord Kilwarden, and when the military officials, pleading the orders of Lord Cornwallis, refused to obey it, they were taken into custody by command of Chief-Justice Kilwarden. This case is of importance in connection with martial law, and has been referred to in recent discussions. Stone, however, cut his throat in prison, and on Nov. 19 he died. See the edition of his journals and political works, with a Life, by his son (two vols., 1826), of which a new edition, entitled *The Autobiography of Wolfe Stone*, was issued by Barry O'Brien in 1893; and also Madden's *United Irishmen*.

**TONGA ISLANDS.** See **FRIENDLY ISLANDS**.

**TONGATABOO**, or **TONGA-TABU**, one of the most southern of the Friendly Islands, in the Pacific Ocean. See **FRIENDLY ISLANDS**.

**TONGRES** (Flemish, *Tongerren*), a town of Belgium, in the province of Limburg, on the Geer, 12 miles south-west of Maestricht. The Church of Notre Dame, in the ogival style, the first on this side of the Alps dedicated to the Virgin, dates from 1240. Tongres has distilleries, tanneries, and a straw hat manufacture. Pop. (1897), 9152.

**TONGUE**, the organ found in the mouth of most vertebrate animals, which exercises the sense of taste, and also assists in articulation and speech. The name tongue is also given to various structures in Invertebrata. In man the tongue is attached by its base or root to the hyoid bone and to the epiglottis. Its tip, sides, upper surface, and part of its under surface are free. Its under surface is fixed to the lower jaw by the *genio-hyoglossi* muscles, and from its sides the mucous membrane is reflected on the inner surface of the gums. In front of the under surface a fold of the mucous membrane is specially developed, and is named the *frenum lingue*. The upper surface is convex, and bears a deep middle line named the *raphé*, which ends behind in front of a deep follicle

or *sac*—the *foramen cecum*. The front two-thirds of the organ are rough, and bear the characteristic structures known as *papillæ*, in which the sense of taste resides. The posterior third is smooth, and exhibits the openings of numerous mucous glands. The substance of the tongue consists of numerous intrinsic muscles, which are named *superior* and *inferior longitudinal* and *transverse* muscles. The mucous membrane consists of an upper layer or *cutis* supporting papillæ, and covered with epithelium. This cutis supports the blood-vessels and nerves, and into it the muscles of the tongue are inserted. The papillæ, which cause the characteristic roughness of the tongue, are of three kinds. The *circumvallate* papillæ number from eight to ten. They are of large size, and are placed on the hinder part of the upper surface, and extend from the raphe in two diverging lines. Each of these papillæ consists of a rounded central and flattened disc, situated in a cup-shaped depression or *fossa*. The exposed part of the papilla is itself covered with numerous smaller papillæ. Each of the circumvallate papillæ measures from  $\frac{1}{16}$ th to  $\frac{1}{8}$ th inch in diameter. The second variety, or *fungiform* papillæ, are more numerous than the circumvallate, and are scattered irregularly over the upper surface of the tongue, but are most plentiful on its apex and sides. They are of large size, of rounded, projecting form, and of a deep red colour. The *filiform* papillæ, forming the last variety, are situated over the front two-thirds of the tongue. They are of very small size, and are arranged in rows corresponding with the rows of the circumvallate papillæ. The filiform projections are of a whitish colour, and are themselves beset with still smaller papillæ. Papillæ of simpler structure are also found over the tongue. In structure the papillæ are like those of the skin (which see), and contain loops of capillary vessels as well as nervous filaments. The mode of termination of the nerves in the papillæ is hardly determined. Numerous *follicles* and *mucous* or *lingual* glands exist on the tongue, the functions of these latter being the secretion of mucus (which see). The epithelium of the tongue is of the flat or scaly kind, resembling that of the epidermis or outer skin, but the deeper cells of the epithelial layer do not contain any pigmentary or colouring matter. The muscular halves or substance of the tongue are divided in the median line by a fibrous *septum*. The arteries are derived chiefly from the lingual and facial trunks, and the nervous supply is distributed in the form of three main nerves to each half of the organ. The *gustatory* branch of the fifth nerve supplies the papillæ in front and those of the sides. The *lingual* branch of the *glossopharyngeal* nerve supplies the mucous membrane at the sides and base, and also the circumvallate papillæ; whilst the *hypoglossal* nerve is distributed to the muscular substance of the organ.

Regarding the exercise of the sense of *taste* by the tongue we may note that the gustatory nerves and glossopharyngeal branches are the nerves which provide the tongue with common sensation and also with the sense of taste, the hypoglossal nerve being that which invests the *muscles* of the tongue with the necessary stimulus. The conditions which appear to be essential for the exercise of this sense are, firstly, the solution of the matters to be tasted—that is, their presence in a form in which their particles may readily come in contact with the nerves of taste. There is thus a strong analogy between the sense of taste and that of touch, since the latter sense must be in a manner exercised before the taste of any substance can be perceived. Then, secondly, the presence of a specialized gustatory nerve is also a necessary condition for the exercise of this sense. Occasionally it

happens, however, that other stimuli than those produced by the actual contact of *apid* substances with the nerves of taste may excite that sense. If a current of cool air be directed on the tongue a saline taste is perceived (Henle); and Balz has shown that a smart tap on the tongue will produce a taste analogous to that excited by electricity. It appears necessary that the surface of the tongue itself should be moist, in order that the gustatory sense may be exercised, and hence the inability to taste substances when the palate and fauces are dry and parched. The tongue itself does not appear to be the exclusive seat of this sense. The soft palate, uvula, tonsils, and upper part of the pharynx, in all probability exercise this sense, although in a minor degree when compared with the tongue. This fact receives an explanation when we reflect that these parts are supplied by branches of the glossopharyngeal nerve. The middle of the tongue appears to be most feebly endowed with the sense of taste, the most sensitive region of the organ being the tip and edges. The tongue may occasionally lose its sense of taste and retain its sensibility to touch, or *vice versa*. It also appears that variations in taste of somewhat unaccountable nature may be observed to occur. Thus Horn has found that while some substances taste alike when touched by every part of the tongue other substances taste differently when applied to different parts of the tongue. Sensations of taste, or at any rate of the impressions of taste, may remain for long periods after the substances tasted have disappeared, whilst, as is well known, the frequent repetition of the same taste dulls the sense. This sense may also be excited by internal stimuli as well as by those of external kind.

TONIC, or KEY-NOTE, in music, the first or fundamental note of any scale; it is the principal sound on which all regular melodies depend, and in which they or their accompanying basses naturally terminate.

TONICS, in medicine (Greek, *tonos*, tension), are remedies which improve the tone or vigour of the fibres of the stomach and bowels, and in fact of the muscular fibre in general. Tonics are of two kinds—medical and non-medical. Medical tonics may be classed, first, as those which act indirectly by first influencing the stomach and increasing its digestive powers; they consist chiefly of the vegetable bitters, among the most important of which are calumba, chamomile, cinchona bark, gentian, quassia, salix, taraxacum, &c. Secondly, those which act directly by passing into and exerting their influence through the blood, and comprise iron, in its various preparations, and the mineral acids, as nitric acid, the various salts of bismuth, copper, iron, silver, and zinc. The non-medical tonics are cold, in its various forms and applications, as the shower-bath and sea-bathing, open-air exercise and friction. In order to insure the beneficial action of medical tonics they must be administered in small doses, but at short intervals. There is, it must be remembered, a limit to the use of tonics; some, such as iron, if too long continued, produce uncomfortable sensations in the head and elsewhere; while bitter tonics, if regularly administered for any length of time, weaken rather than strengthen the digestive powers.

TONIC SOL-FA SYSTEM, in music. For centuries past attempts have been made from time to time to improve the notation of music, all of them aiming chiefly at rendering the key-relationship of tones more clearly perceptible, and dispensing with as many as possible of the embarrassing host of musical characters. The first system which secured general public attention was that of Jean Jacques Rousseau, who substituted the Arabic numerals for the notes of the scale, indicated the high and low

octaves by points written above and below the figures, and the time by means of commas and straight lines. The key-note of a piece was always represented by the figure 1, and sharps and flats by a stroke drawn for the former from left to right, in a slanting direction up through the figure, and for the latter drawn up from right to left. This system has been adopted in France by Galin, Aimée-Paris, and E. Chev , with trifling modifications, and is still used as a stepping-stone to the common, or, as it is often called, established notation. A method similar to this in its essential principles has been spread widely among the English-speaking population of the globe during the last half of the present century, chiefly through the untiring efforts of the Rev. John Curwen, of Plaistow, who is mainly indebted for the leading features of his plan to Miss Glover, of Norwich. In this method,

r'	s'	d'
d'	f'	t
t	m'	l
l	r'	s
s	DOH'	f
f	TE	m
m	LAH	r
r	SOH	d
d	FAH	t
t	ME	l
l	RAY	s
s	DOH	f
f	t	m
m	l	r
r	s	d

MODULATOR.

which is known as the Tonic Sol-fa System, the staff of five lines, with its clefs, signatures, rests, &c., is entirely thrown aside, and the first exercises of the pupil in tune are learned from a pictorial representation of the scale, called the modulator. This shows at a glance the true intervals of the scale; and the characters in the side columns show the relation of a scale to those founded on its dominant and subdominant. To represent the notes the Italian solfeggio syllables were, with some modifications, adopted; they are spelled in English fashion: *Soh* is preferred to *Sol*, as the voice can better dwell upon it; *Te* is substituted for *Si*, as in printed or written music the initials only of the syllables are used, and a different initial from *Soh* is required. The small figure 1 at the head and the foot of the notes indicate the higher and lower octaves of the scale, the middle octave being unmarked. An additional higher or lower octave would be marked in the same manner with the figure 2. The columns of the modulator are meant to represent key-relationship, not absolute pitch. *DoH* in major scales is always the key-note, and may stand for A flat or natural, B, C, D, &c. When the tonic sol-faist uses the first seven letters of the alphabet he employs them to denote sounds of absolute (that is fixed), not movable pitch like his own syllables, and the pitch of a tune is always indicated by these letters. In the tonic sol-fa notation rhythm is marked by a perpendicular line preceding the strong accent or pulse, as Mr. Curwen calls it (fulfilling the function of a bar in the established notation), by a colon preceding the weak accent, and in the compound times by a short perpendicular line preceding the medium accent, thus:—

$\frac{3}{4}$  or  $\frac{2}{4}$  time, | : ||;  $\frac{3}{2}$  or  $\frac{3}{4}$  time, | : : ||;  $\frac{4}{2}$  or  $\frac{4}{4}$  time, | : : ||;  $\frac{6}{8}$  time, | : : | : : ||, &c.

A sol-fa initial placed between these marks represents a note occupying the whole pulse or beat; if the sound is to be continued through two or more beats, a horizontal line takes the place of the initial after the first beat, thus: | d : — | m : r | d : — | — : — |. If a pulse is divided into halves a full stop is put between the notes; if into quarters, commas, and if into thirds inverted commas, thus:— | d : m : r | d, d, d, d : d, d, d |. Other divisions of the bar or

measure are: for a beat and a half | d : — r | m d : — t ||; for three-quarters, | s, f : m, r |; the horizontal lines drawn under the last two pairs of initials is equivalent to the *sur* in the ordinary notation. In the tonic sol-fa notation there are no characters for rests; the suspension of sound is indicated by blanks between the accent marks, thus:— | d : | r : | : m |. We will now, for illustration's sake, translate the first three lines of Example XII. in the article Music, at page 383, vol. v.

KEY C.

d' : d' | m' : — r' | d' t : l, t | d' : — s | d' : — || d' : t | r' : d' | m' r' s' f' | m' r' t, s | d' : — | — : ||  
| d' : r' | t : d' | r' : — f' | m' r' : d' | f, m' r' d' | t, l : t, s | d' : t | d' : — ||  
d' : — : — | r' : — : — | m' d' : s' | f' r' : t | d' m' d' | s : — : — | d | m : f : r | d : — : m | s : — : l | s : — : ||  
; d' : d' : r' | t : — d' : r' || d' : d' : d' | m' : — r' : d' | t : t : d' | t : l : s ||

In modulating into a new key, the note from which the transition is taken is indicated by a combination of the syllabic name which it has in the old key with that which it has in the new, thus:—

KEY G. D.t  
|| d | f : m | r : — || r s | l t : d' | d' : t | d' : — ||

The letters D.t placed above the beginning of the last section of the example indicate that the tune has passed into the key of D, and that it is the note t which is the characteristic note in the new key. In

brief transitions from one key to another, which most frequently occur in cadences, it is not found necessary to use the bridge-tones and the syllables of the new key; the characteristic tone is treated as a chromatic tone, and the above passage might be written thus:—

|| d | f : m | r : — || r | m f e : s | s : f e | s : — ||

Chromatic tones which do not change the key are expressed by changing the ordinary vowel sound of the note into e when it is sharpened, and into a when

it is flattened: thus *dot* becomes *de*; *ray*, *re*, and so on, and *me* becomes *ma*; *fa*, *ta*; &c. The minor is not regarded as a different scale, but simply as a mode of the major, *lah* acquiring the character of a key note by its seventh (*soh*) being sharpened into *se*, while the ascending sharp sixth becomes *ba*. A tune written in what those accustomed to the common notation would recognize as being in the key of A minor, the tonic sol-fa pupil is taught to consider as being in the key of C, minor (or *lah*) mode.

Such is a brief outline of the system, which, in the opinions of its promoters, possesses many and important advantages over the old notation, the chief of which are the distinctness with which it indicates the key-note and the position of the semitones; the absence of a host of unnecessary symbols which perplex the eye and strain the memory of the pupil at the outset; the readiness with which it can be written, and the cheapness with which it is printed. It is, however, objected to it that it is inferior to the established notation in not directly representing pitch to the eye, in being poorly adapted for instrumental scores, and its acquirement not forming an introduction to the classic regions of musical literature. It is but fair to state in answer to these last two objections that an increasing number of organ and piano-forte players prefer the new notation, that it is used for stringed and brass instruments both by solo players and in bands, and that only time is wanted by the promoters to publish all such works as are of sterling value and lasting fame. It is often found that tonic sol-fa pupils readily learn the old notation, and are generally ambitious to do so; and thus the new system serves as a stepping-stone to the old rather than a substitute for it, as some are sanguine enough to believe. It is extensively used by teachers in public schools, and very high praise is given it by some of the inspectors, who agree that it is by far the simplest plan for teaching young people. See Curwen's Grammar of Vocal Music; Standard Course; How to Observe Harmony; and the monthly periodical, the Tonic Sol-fa Reporter.

**TONKA** (or **TONGA**) **BEAN**, the seed of the *Dipteryx odorata*, natural order Leguminosæ, a large tree found growing in the forests of Brazil, Guiana, &c., to a height of 60 or 80 feet. The fruit is an oblong, dry, fibrous drupe containing but one seed, which has a strong pleasant odour resembling that of new hay; it is derived from a concrete volatile oil to which the name of Coumarin or Tonka camphor has been given. (See **COUMARIN**.) The Tonka-bean is much used as a perfume, especially for snuff; it is also put among clothes, which it is said to protect from insects, besides communicating a pleasant odour.

**TONNAGE**, a word originally signifying the number of tons weight which a ship might carry with safety, but now used to denote the gauge of the vessel's dimensions, and the standard for tolls, dues, &c. Previous to 1835 the rule was to multiply the length of the ship by the breadth, assume the depth to be the same as the width, multiply by this assumed depth, and divide the product by 94, the quotient being the tons burden. This system was both misleading and dangerous. As harbour and light dues were charged according to tonnage, ship-owners built their vessels so deep and narrow that they were in many cases unseaworthy. A much better system was introduced by the act of 1835, and this act was strengthened and modified by the Merchant Shipping Acts of 1854 and 1894. The instructions in these statutes not only take into account the depth of the vessel, but also make allowances for the varying curvature of the hull. The depth from the deck to the bottom of the hold is taken at different places, and the breadth is

measured at different elevations in the depth. If the vessel is a steamer, an allowance is made for the space occupied by the engine-room, boilers, coal-bunks, &c. In vessels with a poop on the upper deck, the tonnage of this poop space must be added. The total capacity in cubic feet, ascertained in accordance with the instructions of the above acts, is divided by 100, and the result is the gross register tonnage of the vessel. The United States adopted the essentials of the British system in 1864, and practically all maritime nations have followed suit, though some of them use also the cubic metre as a unit. The register ton is equal to 2·8315 cubic metres (denoted by cbm. or M<sup>3</sup>), and a cubic metre is equal to ·35317 of a register ton. In freighting ships, 40 cubic feet of merchandise is generally taken as a ton.

**TONQUIN**, or **TONGKING**, a French colonial possession in Indo-China, bounded on the north by China, east by the Gulf of Tonquin, south by Annam, and on the west by Burma and Siam; area, estimated at 46,400 square miles. The surface near the sea is a rich alluvial plain, and the interior is generally well watered and of high fertility. The chief river is the Song-ka or Red river. The chief products are rice, sugar, cardamoms, coffee, cotton, silk, and tobacco. There are also coal, iron, and copper mines. An independent state till 1802, Tonquin was a province of Annam from that date till 1885, when it was ceded to France. The capital is Hanoi. The population is estimated at 7,000,000.

**TONSURE** (*corona clericalis*), the name given to the bare place on the heads of the Roman Catholic and Greek priests, formed by shaving or cutting away the hair and keeping it so. The custom of cutting away the hair in token of the dedication of a person to the service of God is very ancient, being mentioned as early as the fourth century. The tonsure furnishes a means to distinguish the higher clergy from the lower, as the extent of the tonsure increases with the rank. Many religious orders (for example, the Franciscans) allow only a narrow strip of hair around the head to grow: all above and below is shaved. Shaving the hair precedes consecration: it is performed by the bishop. The tonsure qualifies the subject for holding a simple benefice, and subjects him to the laws relating to ecclesiastics.

**TONTINES**, a kind of life annuity, so called from Lorenzo Tonti, an Italian who invented this kind of life annuities, and first introduced them into France in 1653, under Louis XIV. His method was the following:—A certain capital was lent out by a society, generally at the usual rate of interest. This interest was divided equally among the members of equal age; and among those of unequal ages it was divided in proportion to their age. This interest was paid as long as one of the society remained alive, and when one of the members died his portion of the income was inherited by the surviving members, so that the last survivor enjoyed, during his life, the whole income. At his death the interest ceased, and the borrower obtained the capital. See **ANNUITIES**.

**TOOKE**, **JOHN HORNE**, was born in Westminster, in 1736. His father, John Horne, was a poulterer, who had acquired considerable property. Tooke was educated both at Westminster and Eton, whence he was removed to St. John's College, Cambridge. In 1756 he entered himself of the Inner Temple; but in 1760 he consented to take orders, or in his own words suffered 'the infectious hand of a bishop to be waved over him,' and was inducted to the chapel of New Brentford, which his father had purchased for him. He became a friend of Wilkes, and zealously supported him in his candidature for Middlesex; but the two afterwards fell out, and in 1770 and 1771 a public altercation took place between



them. The year 1771 also witnessed his contest with Junius, in which, in the general opinion, he came off victor. In 1773 he resigned his clerical gown, with a view to study for the bar (to which, however, from being in orders, he was not admitted); and it was by his legal advice to Mr. Tooke of Purley, in opposing an inclosure bill, that he acquired the friendship of that gentleman, from whom he ultimately inherited £500, and whose name he assumed. He was a warm opponent of the American war, and was prosecuted for sedition for the wording of a resolution by which the Constitutional Society voted £100 to the widows and children of the Americans 'murdered by the king's troops' in the battle of Lexington. For this obnoxious paragraph he was tried at Guildhall in 1777, and sentenced to a year's imprisonment and a fine of £200. In 1780 he published a keen review of Lord North's administration, in a pamphlet entitled *Facts*, and in 1782 a *Letter on Parliamentary Reform*. In 1786 he published in an octavo volume his work entitled *Epea Pteroenta* (Greek for 'Winged Words'), or the *Diversions of Purley*, part i. In 1790, and again in 1796, he offered himself as a candidate for Westminster, but failed; and in 1801 he accepted the seat for Old Sarum, on the nomination of Lord Camelford. His political life closed with the dissolution of Parliament in 1802. In 1798 he published a second part of the *Diversions of Purley*, with a new edition of the first. He died at Wimbledon in 1812, in his seventy-seventh year. Tooke possessed considerable learning. His work, the *Diversions of Purley*, is original and ingenious, and has exercised considerable influence on the subsequent development of philological investigation. The best biography is that of Stephens (two vols., 1813). See also the second series of Thorold Rogers's *Historical Gleanings* (1870).

**TOOTH.** See **TEETH**.

**TOOTHACHE**, a well-known affection of the teeth arising from various causes. Inflammation of the fangs of the teeth is a common cause, having its seat either in the soft membrane covering the fang, or in the pulp of the tooth. The tooth in this case often feels loose in the socket, and is very tender when touched. If the inflammation is not reduced, matter forms, and the result is a gum-boil. Caries is a frequent cause of toothache, the central part of the tooth rotting away and exposing the nerve. Neuralgic toothache is a purely nervous variety, and may occur either in sound or carious teeth. It comes and goes suddenly in paroxysms, and is accompanied by little or no swelling. There are many so-called remedies for toothache, but they are very often of merely temporary benefit, and in the end do more harm than good. One of the best palliatives is to push a little cotton dipped in chloroform into the cavity. As a preventive against toothache the teeth should be kept scrupulously clean, and when they show symptoms of decay the services of a skilful dentist should be had recourse to. The decay of a tooth is very often arrested by stopping or filling up the cavity.

**TOP (nautical).** See **SHIP**.

**TOPAZ**, a gem in jewelry, and one of the most interesting species in mineralogy. Its crystals are short prisms, terminated at one or both extremities by a great number of facets, the primary form being a trimetric prism of  $124^{\circ} 22'$ . It cleaves with readiness at right angles to the prismatic axis, but with considerable difficulty parallel to the lateral faces of the primary form; fracture more or less perfectly small conchoidal, or uneven; the lateral faces are deeply striated vertically, while the terminal planes are smooth and brilliant; lustre vitreous; colour

white, yellow, green, blue; the shades are generally pale; transparent to translucant; hardness intermediate between quartz and corundum; specific gravity, 3.49. It also occurs massive, the composition being granular, and the individuals varying much in size. There occurs, also, a columnar composition, in which the individuals are thin, long, and parallel, and their faces of composition longitudinally streaked. The analyses of topaz show that it consists of from 34.39 to 35.66 per cent of silica, from 54.88 to 55.96 per cent of alumina, and about 10 per cent of fluorine; it may therefore be regarded as a tribasic silicate of aluminium ( $Al_2O_3.SiO_2$ ), in which part of the oxygen is replaced by fluorine. Those crystals which possess different faces of crystallization on opposite ends acquire different kinds of electricity on being heated; by friction it acquires positive electricity. Among the varieties of topaz employed in jewelry are the following, the distinctions between which depends upon their colours:—1, *colourless or white topaz*; 2, *blue topaz*, or *oriental aquamarine*; 3, *straw-yellow topaz*; 4, *wine-yellow topaz*; 5, *brownish-yellow topaz*; 6, *pink-coloured topaz*, which is produced by heating in a sand-bath, to a moderate degree, the deep-yellow Brazilian crystals. The topaz is too abundant to command the extravagant prices of some other gems; for it is not only afforded plentifully in Brazil, but it is found also in the tin mines of Saxony, Bohemia, and Cornwall; in the Altai Mountains and the Urals; in the United States, &c. Large quantities of pebbles and loose crystals are frequently brought from Brazil and from Australia. The finest crystals are brought from Minas Geraes in Brazil.

**TOPAZ HUMMING-BIRD** (*Chrysolampis moschilus*), a species of humming-birds, so named from the beautiful topaz colour of the throat, the head being of a deep ruby tint. This species is common in Guiana, Trinidad, and Bahia, and is in much request on account of the demand for its plumage as a decoration for ladies' hats—a demand exceedingly to be regretted. Another genus also, including forms known as *Topaz Humming-Birds*, is the genus *Topaza*, which includes the *Fiery Topaz* (*T. pyra*) and the *Crimson Topaz* (*T. pella*, see *Plate I*, at *ORNITHOLOGY* and the plate at *HUMMING-BIRDS*). The latter, also known as the *King Humming-Bird*, is found in Trinidad and Surinam, and the former in the Rio Negro district. The *Fiery Topaz* is coloured of a general bright scarlet with a deep black head and neck, and a green throat with a central crimson patch. The *Crimson Topaz* is of a deeper red hue, and possesses a reddish-buff tail.

**TOPE.** See **SHARK**.

**TOPE**, a popular name for a species of Buddhist monument intended for the preservation of relics. The oldest monuments of this kind are spherical or elliptical cupolas, resting on a circular or rectilinear base, with an umbrella-shaped roof, and sometimes with a series of roofs of this form which develop into a spire, pyramid, or other architectural ornament. In the interior is a cell or chamber for containing the box with relics; but in some cases no relics have been found, and it is supposed they have been buried under-ground.

**TOPEKA**, a city of the United States, capital of Shawnee county and of the state of Kansas, on both banks of the Kansas River, 45 miles w.s.w. of Leavenworth, at the intersection of two important lines of railway. It has wide streets crossing each other at right angles, and contains a handsome capitol, cathedral, two higher colleges, free library, lunatic asylum, post-office, &c. There are several flour-mills, iron-foundries, a rolling-mill, machine-shops, a pottery, brick-kilns, a carriage-factory,



breweries, &c. Bituminous coal is found in the neighbourhood. Pop. (1890), 31,007.

**TOPLITZ.** See **TEPLITZ**.

**TORGAU**, a town of Prussia, province of Saxony, 45 miles N.W. of Merseburg, on the left bank of the Elbe, here crossed by two bridges, one of which carries the railway. It has a former castle, now used as a barracks, an old town-house, court buildings, an old gymnasium, hospital, fortress prison, &c. In 1891 it ceased to be a fortress town, and the fortifications were handed over to the municipality. Pop. (1895), 11,780.

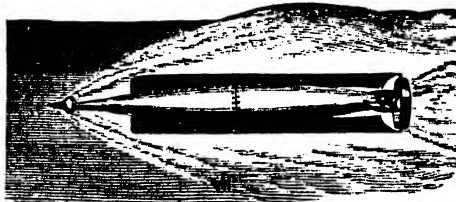
**TORONTO**, a city of Canada, capital of Ontario, county of York, on the N.W. coast of Lake Ontario, between the mouths of the Don and the Humber, with a harbour protected by a long low island, 315 miles W.S.W. of Montreal. Its site is low, but rises gently from the water's edge to a height of above 100 feet. Toronto is the seat of law and of provincial government, and the head-quarters of the educational department of the province. The whole town forms nearly a parallelogram, the streets crossing each other at right angles. They are wide, well paved, and in general of handsome architecture, many of the shops and private houses being very superior in style. The common material is brick, of a pleasing light colour. The public buildings are numerous, and many of them very handsome. The churches most worthy of notice are the Church of England and the Roman Catholic cathedrals, both in the Pointed style, of which the former is an excellent specimen. Among the other remarkable buildings are the lieutenant-governor's residence, an elegant structure; the magnificent new Parliament Buildings, containing the government offices, and a handsome and well-decorated legislative hall; the Osgoode Hall, the seat of the provincial lawcourts; the normal school buildings, containing the offices of the council of education, a set of model schools, and an educational museum; the University of Toronto, situated in beautiful grounds, the main building, a Norman structure with a massive tower and richly-sculptured doorway, having been rebuilt after almost total destruction by fire in 1890; Trinity College, in connection with the Church of England, a highly-ornate building; the custom-house, the post-office, the Government School of Practical Science, the Crystal Palace, where the provincial agricultural exhibitions are held, and the lunatic asylum, about 1 mile from the city. The principal public halls are the St. Lawrence and the Music Hall. Queen's Park, adjoining the university, is the principal public park. The university is one of the best equipped in America. Other educational institutions are: Knox College, a Presbyterian theological institution; Wycliffe College, an Anglican theological college; M<sup>c</sup>Master University, supported by the Baptists; Victoria Methodist College; St. Michael's Roman Catholic College; two schools of medicine; and a veterinary college. Among scientific and literary institutions are the Canadian institute, the observatory, mechanics' institute, &c. The manufacturing industries of Toronto include iron-founding and engineering, distilling and brewing, tanning, pork-packing, the manufacture of soap, sewing-machines, boots and shoes, &c. The railway connections of the city are very extensive and important. Toronto was founded in 1794 and was originally named York. Pop. in 1881, 86,415; in 1891, 181,215; in 1901, 208,040.

**TORPEDO.** Under this general head we may treat of two distinct classes of submarine destructive agents, namely, torpedoes proper, which are movable and are propelled against an enemy's ship; and

submarine mines, which lie stationary in the water. Torpedoes proper take various forms. A charge of powder or other explosive compound confined in a strong case with a percussion fuse in it, carried at the end of a pole, and pushed by one vessel against the side of another so as to explode below the water-line, is termed an outrigger torpedo, or spar torpedo, and in this comparatively simple form torpedoes were used in the American civil war, and by the French with effect against Chinese ships in 1884. Two well-known forms of torpedo are Captain Harvey's towing torpedo and Mr. Whitehead's locomotive fish torpedo. That of Captain Harvey, now of no practical importance, is constructed to be pulled through the water, something in the manner of a ship's log. It is of such a form as to pull the line out at a considerable angle to the keel of the towing vessel, which endeavours to manœuvre so as to draw it under the stem of an enemy, and explode it on contact by means of a trigger bolt. This form has, however, been superseded by the Brennan, Victoria, Patrick, Lay, Sims-Edison, Halpin-Savage, and other forms of torpedo controlled by means of electricity. Attempts are now being made to perfect torpedoes guided by electricity wirelessly conveyed.

Whitehead's fish torpedo is a very unique design (see Fig. 1), and is the starting-point of the most effective types, such as the Howell. It is projected

Fig. 1.

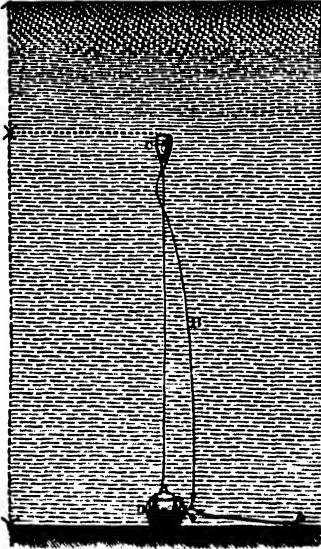


from a special torpedo-tube in a ship either above or below the water-line, but it can also be plunged from the deck. It may be described as a cigar-shaped vessel varying from 14 to 19 feet in length and from 14 to 16 inches in diameter. It is made of bronze, and is divided into three compartments. The head contains the gun-cotton charge and the fuse for exploding it; the central part contains the engines by which it is propelled, and which are worked by compressed air stored in the third or tail compartment. The propeller is a three-bladed screw, which can move the largest torpedoes at a speed of 24 knots for the distance of 220 yards, the distance of 1000 yards being reached at a slower rate of progress. When discharged from a ship's deck it rises and descends, following a waving course in a vertical plane for perhaps a hundred yards, after which it runs on steadily at the depth for which it is adjusted. It can be adjusted to move at various depths below the surface of the water, and its course and behaviour are subject to control to a remarkable extent. Most war-vessels carry torpedoes, but they are the special armament of the low, swift vessels called torpedo-boats. (See **WAR VESSELS**.)

Submarine mines offer a more reliable means of systematic defence than torpedoes. A submarine mine consists of a charge of gunpowder, gun-cotton, or other explosive confined in a strong metal case, and anchored either at the bottom of the water or at a certain depth below the surface. The method that has received most attention in Great Britain is the system brought in mainly by the late Sir Frederick Abel. The general arrangement may be

best understood by reference to Fig. 2. The mine is contained in the iron case D. This is connected by a strong iron-wire rope with a smaller iron case at C, termed a 'circuit-closer'. This has a sort of pendulum arrangement by which, when it is tilted over from contact with a vessel's side, an electrical circuit through the line B A is completed with a battery on shore, which fires the charge in D. Special means are provided for constantly testing the state of each mine and circuit-closer and wire connection, but the necessary explanation is hardly of a length and character suited to this work. The arrangement is such that a mine may be fired at will from shore without actual contact of a vessel, or it may be fired by such contact. On the other hand, it may be set so as to allow vessels to strike the circuit-closer without the possibility of firing the charge, so that the

Fig. 2.



passage of a friendly vessel may at any moment take place through a defended channel. Several lines are necessary generally to ensure that a vessel must be struck in forcing an entrance, for if the mines were placed so close together as would be necessary to close the channel by a single line, the explosion of one mine might ignite that next it, and so several might be fired, and a wide opening made which the enemy might profit by. Experiments have shown that large charges (such as 500 lbs.) laid deep produce little effect compared with small charges of about 50 lbs. floated close to the surface, and exploded by actual contact with the ship's side. Self-acting mines are very dangerous to handle. At the close of the French and German war so many accidents occurred in the German waters in trying to recover them that it was decided to explode them. A line of submarine mines must always be defended by powerful batteries of artillery, for otherwise it is obvious attempts may be made by the enemy to destroy them at leisure. This is easily done by daring men in boats, who may drag for them, and either explode them when a long way off, or cut their connections, or, lastly, fish them up. It has been laid down as an axiom, and seldom disputed, that while ships can run past almost any batteries in an unobstructed channel, a channel well defended by

submarine mines, under the fire of powerful batteries, cannot be forced by any fleet.

**TORPEDO** (see Plate I. at ICHTHYOLOGY), a genus of Rays (which see), forming the type of the family Torpedinidae, and noted for their power of giving electrical shocks by means of specially-developed electrical organs. The family Torpedinidae is distinguished by the body being rounded in front, the back being also round and destitute of scales. The tail-fin exhibits a three-cornered shape, and the teeth are pointed. The edges of the 'spiracles' or breathing apertures are serrated. In the torpedo the electrical organs exist in the form of two large masses placed one on each side of the skull, and between the cranium and the base of the pectoral fin. Each mass is composed of a large number of vertical columns, separated by membranous partitions, and presenting, when viewed from the upper aspect, a honey-comb or cellular appearance. The entire apparatus, in fact, constitutes a kind of Voltaic battery, and is richly supplied with nervous filaments derived from the *nervi vagi* or eighth pair of nerves. The production of electricity by these and by other fishes is readily enough explicable on the ground of the conversion of an equivalent of nerve force into electrical force through the medium of the electrical organ; just as, under other circumstances, nerve force is converted into motion through the muscles. The Torpedoes occur chiefly in the Mediterranean Sea, and in the Indian, Pacific, and Atlantic Oceans. A large specimen may measure 4 feet long, and weigh from 60 to 70 lbs. The power of the electrical organ appears necessarily to vary with the health and size of the animal; but there is little doubt of the exceedingly potent nature of the apparatus, especially under excitement. The identity of the force generated by these fishes with ordinary electricity has been fully and experimentally demonstrated; and the suggestion has been thrown out that the rapid decomposition which appears in the bodies of animals killed by this means may be adapted for rendering the prey of the electrical fishes more readily digested. This suggestion is strengthened by the fact that in these fishes the digestive system is exceedingly short. The principal species is *T. marmorata*, which occurs in the Mediterranean in muddy shallows. For other species of electrical fishes see ELECTRICAL FISHES.

**TORQUAY**, a municipal borough and watering-place of England, in Devonshire, pleasantly situated on a series of heights and depressions on the north side of Torbay, and on a branch of the Great Western Railway, 21 miles south of Exeter. It is well built, and consists principally of two streets, one of them about 1 mile long, of several commanding terraces, and of a great number of isolated villas, with gardens attached. Among the places of worship are several churches, all handsome structures; there are also assembly-rooms, libraries, and reading-rooms, a town-hall, a royal public hall, a hospital, museum, public gardens and baths, a long pier, forming an excellent promenade. The water supply and drainage system are among the finest in the kingdom. The progress of Torquay has been, and continues to be, rapid owing to its attractions as a watering-place. For invalids its climate in winter is among the mildest and best in England. Pop. in 1891, 25,534; in 1901, 33,625.

**TORQUEMADA**. See INQUISITION.

**TORRE DEL GRECO**, a town of Italy, on the east shore of the Gulf of Naples, at the south-west foot of Mount Vesuvius, and 8 miles from the city of Naples. The town has suffered much by eruptions of Vesuvius. It is a sea-bathing resort and has a coral-fishery. Pop. about 20,000.

**TORRENS, LAKE.** See AUSTRALIA.

**TORRES STRAIT**, the strait which separates Australia from Papua, its distance across, from Cape York, the most northern point of Australia, to New Guinea, being about 80 miles. It is crowded with islands, shoals, and reefs, rendering its navigation difficult.

**TORRES VEDRAS, LINES OF**, so called from a small village lying on the road from Lisbon to Coimbra, 24 miles north-west of the former. These stupendous works, constructed by Wellington in 1810, consisted of two lines, the one extending from Alhandra on the Tagus to the mouth of the Zizandra on the Atlantic Ocean, 29 miles in length; and the other, in the rear of the former, reaching from Quintella on the Tagus to the mouth of the Lorenza on the ocean, 24 miles in extent, forming an impenetrable barrier between the enemy and Lisbon. The lines of Torres Vedras saved Lisbon, baffled a well-appointed French army, and gave Wellington a fair opportunity to enter upon offensive operations. See SPAIN.

**TORRICELLI, EVANGELISTA**, an illustrious mathematician and philosopher, born at Faenza, in Italy, in 1608. He early devoted himself to mathematical studies, and having read Galileo's Dialogues, composed a treatise concerning motion according to his principles. Galileo having seen this conceived a high opinion of the author, and engaged him as his amanuensis. He accordingly went to Florence in October, 1641; but Galileo dying three months after, Torricelli was about to return to Rome, when the Grand-duke of Tuscany, Ferdinand II., engaged him to continue at Florence, giving him the title of ducal mathematician and the promise of a professorship in the university on the first vacancy. He died at Florence in 1647. Torricelli's name is important in the history of science as the discoverer of the natural law according to which fluids rise in an exhausted tube from an open vessel exposed to the pressure of the atmosphere, namely, that the weight of the fluid which rises in the tube is equal to the weight of an equal surface of atmospheric air of the height of the atmosphere. See BAROMETER.

**TORRINGTON, GREAT**, a municipal borough and market-town of England, in Devonshire, on an eminence rising above the river Torridge, 5 miles south by east of Bideford, a terminus of the London and North-Western Railway. It has an ancient Decorated church (restored); nonconformist chapels; a town-hall; a market-house and covered markets; library, reading, and recreation rooms; manufactures of gloves and collars, besides fell-mongering and tanning. General Monk was born in the vicinity. Pop. (1891), 3436; (1901), 3241.

**TORSIONAL RIGIDITY**, the stiffness of a cylindrical bar of material to resist twist. Torsional rigidity may be compared by finding the forces acting at a given leverage which will twist equal cylindrical bars of different materials through the same small angle. The rigidity of cylinders of the same substance and of equal length varies as the diameter in the fourth power. If  $l$  be the length of the bar,  $w$  the pressure at the end of the lever,  $a$  the length of the lever,  $d$  the diameter of the bar, and  $\phi$  the angle of torsion, we have  $\phi = c_1 \frac{l w a}{d^4}$ , where  $c_1$  must be found by experiment for the various materials.

Torsional resistance to damage is independent of the length of the bar, and we have  $w a = c_2 d^4$ , or

$$d = \sqrt[3]{\frac{l w a}{c_2}}. \text{ The practical rule for cast-iron and wrought-iron shafts is } d = \sqrt[3]{\frac{240 H}{s}}, \text{ where } H \text{ is}$$

the horse-power, and  $s$  is the number of revolutions per minute. It will be seen that this rule, although the number 240 allows enormous extra strength, is in accordance with the formula above, which is arrived at by theoretical consideration. (Abstracted from unpublished lecture notes of Professor J. Thomson.)

**TORSION BALANCE**, an instrument employed by Coulomb to measure the attractions and repulsions of electrified bodies, and also to investigate the mutual action of magnets. The torsion balance was also employed by Cavendish in his experimental determination of the mean density of the earth. The

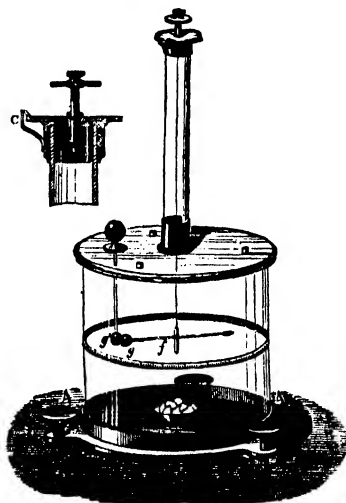


figure represents the torsion balance as applied to electrical measurements. An enlarged representation of the top of the instrument is given at the left of the figure. The repulsion between the electrified balls  $g g'$  is balanced by the resistance to torsion of the fine metallic wire on which the needle  $f$  of shellac is suspended, and the angle of torsion is given by the index  $c$ , which shows the angle through which the upper end of the wire  $d$  has been turned to balance the repulsion between the balls. A watch-glass containing pumice moistened with sulphuric acid, which serves to keep the instrument dry, is shown in the interior. It is easy to see how the instrument may be modified to suit the various purposes to which it has been applied.

**TORSO** (Italian), an art term signifying the trunk of a statue of which the head and the extremities are wanting. One has become particularly celebrated, namely, the *torso* of Hercules, in the Belvedere at Rome, considered by connoisseurs one of the finest works of art remaining from antiquity. A Greek inscription ascribes it to the artist Apollonius. It was found towards the end of the fifteenth century in Rome.

**TORT**, in law, denotes injustice or injury. The word is French. Actions upon torts or wrongs are all personal actions for trespasses, nuisances, assaults, defamatory words, and the like.

**TORTOISE**, the name applied to various genera of reptiles included in the order Chelonia, along with the Turtles and their allies. The distinctive features of the Tortoises and other Chelonians consist in the modification of the skeleton and of the skin-structures or scales to form the well-known bony box in which their bodies are inclosed. Thus the spinal elements of the back, together with the

expanded and united ribs, form the carapace or back; whilst the sides of the box are formed by marginal plates, which are regarded variously by zoologists as representing either the ossified and modified cartilages of the ribs or as membrane-bones developed by the skin. The plastron or floor of the body is formed by nine pieces, the nature of which is equally a subject of dispute amongst naturalists. Owen regards the plastron as representing a greatly modified breast-bone or sternum; whilst other naturalists maintain that a breast-bone is wanting in Chelonians, as in Serpents, and that the plastron is simply composed of membrane-bones developed like the marginal plates by the skin, and having no homologies with the true or internal skeleton. The latter view is probably the correct one. The Tortoises belong to three great divisions of their order. The familiar and typical Tortoises belong to the division Testudines, in which the horny jaws are unprotected and adapted for cutting, or may be divided into serrated processes. The eyes exist on the sides of the head, and the tympanic membrane is exposed. The limbs are short and stunted, and the toes are bound together by the skin. Well-developed nails exist; and the horny plates, which cover the carapace, and which represent skin or dermal structures, are also present in a perfect condition. The carapace is, moreover, very convex, and occasionally—as in the well-known Box Tortoises (*Pyxis* and *Cinyxia*)—the front or hinder part of the carapace may be movable, and shuts up like the lid of a box, when the head, limbs, and tail are retracted within the bony case. The most familiar example of the Testudines is the Common or European Tortoise (*Testudo Græca*), so frequently domesticated as a household pet, and which occurs chiefly on the western borders of the Mediterranean Sea. These animals have the habit of hibernating through the colder season of the year, and retire to some quiet corner, from which they emerge in spring. The Mauritanian or Land Tortoise of North Africa (see Plate I. at art. REPTILES) is closely allied to this species. The Great Indian Tortoise of the Galapagos Islands (*Testudo Indica*) is remarkable for its great size, attaining a length of 3 feet. The curious genus *Cinyxia*, of which the Box Tortoise (*C. arachnoides*) is a familiar species, is remarkable for the curious development of the front part of the plastron, which shuts over the anterior aperture of the shell like a lid, when the animal withdraws itself into its case. These tortoises occur in Asia and in Madagascar. Another genus of Box Tortoises—more properly, however, included among the Terrapins—in which the hinder part of the plastron forms a lid, is that named *Cistudo*, of which the *C. Carolina* of North America is a favourable example. This species is sometimes named the Pine Terrapin from its habit of living in pine forests. It is rarely, if ever, found in the vicinity of water. The Terrapins form the section Emydæ, and are sometimes described under the names River or Marsh Tortoises. The jaws are horny and cutting, and are uncovered by lips. The tympanum is exposed; and the limbs, which are more slender than those of the True Tortoises, are provided with five toes, which are united by a web. In some of the Terrapins (*Emys*, *Cistudo*, &c.) the head can be almost completely withdrawn into the carapace. In others (such as *Chelys*, &c.) the head can be only partially withdrawn. Of the Terrapins a very familiar example is the *Emys scripta* or the Lettered Tortoise of North America, so named from the markings of its body. The genus *Emys* itself includes a large number of species. The *Emys Europæa* or Common European Marsh Tortoise is

shown in the first plate at REPTILES, fig. 3. It is coloured black, with yellow spots. Other genera include the Alligator Terrapin (*Chelydra serpentina*, fig. 4) of America, which derives its name from its rather predacious habits, whilst its name of 'Snapping Turtle' (also applied to the *Trionyx ferox*, a Soft Tortoise) has been given to it from its habit of snapping its jaws when irritated or alarmed. Its adult dimensions often exceed 3 feet, and the sharp jaws, moved by powerful muscles, constitute dangerous weapons of defence or attack. The Matamoras (*Chelys Matamoras*, fig. 5) represents another genus of Terrapins, and occurs in South America, being common in Cayenne. Its length when fully grown is about 3 feet. The Mud or Soft Tortoises form the division Trionychoides, in which the jaws have soft, fleshy lips, the nose being prolonged to form a snout, and the head being covered by a soft skin, which conceals the tympanum. The limbs are of flattened shape, and of the five toes only three are furnished with nails. There are no horny plates developed in the skin. Very frequently also the ribs are not so completely modified to form a hard carapace as in other Chelonians. The Soft Tortoises occur in Asia, Africa, and North America. The North American Snapping Turtle (*Trionyx ferox*, fig. 6) is a familiar example of these animals. It is exceedingly destructive to large numbers of young alligators. See also TURTLE and REPTILIA.

TORTOISE-SHELL. See TURTLE.

TORTOISE-SHELL BUTTERFLY (*Vanessa urtica*), a genus of Butterflies, distinguished, like other members of the genus *Vanessa* (such as the Peacock Butterfly—*V. io*—the Camberwell Beauty, &c.), by the clubs of the antennæ being short, by the eyes being hairy, and the front wings of angular conformation. The larvæ of the Tortoise-shell Butterfly feed upon the nettle.

TORTOLA, one of the Virgin Islands (which see).

TORTONA, a town in Northern Italy, 12 miles east of Alessandria, in the province of Alessandria, at the foot of a bare and uncultivated hill, on the right bank of the Scrivia. It is an ancient place, and was once of great strength, but its fortifications were completely destroyed by the French after the battle of Marengo, so that now only some vestiges of the citadel and a single gate remain. The principal edifice is the cathedral. The manufactures consist of silk goods, bombazine, and other stuffs; and there is a considerable trade in corn and wine. Pop. 8620.

TORTOSA, a city of Spain, in Catalonia, 48 miles south-west of Tarragona, on a hill slope on the left bank of the Ebro, here crossed by a wooden bridge. It is fortified on all sides, and some portions of the walls are of great antiquity. The town, which is entered by three gates, consists of irregular, ill-paved, narrow, and on the north and south steep streets; several small squares, and houses generally well built of granite, and three or four stories high. It carries on an important trade, through its two ports, El Fangar and Los Alfaques, at the mouth of the Ebro, as well as directly—the river being navigable by vessels of 100 tons—in wheat, timber, wine, oil, wool, alum, silk, barilla, soda, charcoal, liquorice, fruits, &c. Pop. (1887), 25,192.

TORTURE, the arbitrary and especially excessive infliction of pain judicially, whether to extort confession or to aggravate punishment. The extortion of confessions from a suspected person, or of discoveries from a condemned criminal, by torture, has been common in all the nations of modern Europe. It was also practised by the ancient Romans, although, during the republic, only upon the bodies of slaves. Under the emperors freemen were sometimes tor-

tured. The belief of the Middle Ages in the immediate interference of God for the protection of innocence and the exposure of guilt, which gave rise to the ordeal and judicial combat, contributed much to extend the use of torture, by leading to the notion that Divine Providence would aid the innocent to endure pains which the guilty would be unable to sustain. The church, which in other respects gave a new form to the system of judicial process, set the example in this practice also; and when the old superstitious means of discovering guilt (see ORDEAL) lost their efficacy, torture became general in Europe. English lawyers assert that torture has never been legally practised in that country. This contention is, however, of little value, as there can be no doubt the law has indirectly sanctioned, if it has not directly enjoined it. (See PEINE FORTE ET DURE.) There are many instances of its employment as late as the reigns of Elizabeth, James, and Charles I. In Scotland the practice of torture was not wholly disused till the close of the seventeenth century. In France the practice existed down to the revolution. In Germany, though restricted by the *Carolina* (see CAROLINA), torture continued to be practised in the German states till the close of the eighteenth century. The principal instruments of torture in England were the *rack*, the *thumb-screw*, and the *boot*. There were also the *scavenger's daughter*, a broad iron hoop used to compress the body and limbs together; and the *little-case*, a box in which a prisoner was confined for days, of such dimensions that in no attitude could he stretch his body to full length. The rack was a large open frame of oak, under which the prisoner was laid on his back upon the floor, with his wrists and ankles attached by cords to two rollers at the end of the frame. These rollers were moved by levers in opposite directions, till the body rose to a level with the frame; questions were then put, and if the answers were not satisfactory the sufferer was gradually stretched till the bones started from the sockets.

TORY, a historical party name of uncertain origin used to designate one of the great political parties of England. The word, according to general consent, is of Irish origin, and is probably derived from the Irish *toiridhe*, *toruighe*, a pursuer, a plunderer. It is said by Defoe to have been used in the time of Queen Elizabeth to designate the Irish rebels, whom he represents as robbers who preyed upon the country. The name was introduced in English politics in 1679 on the occasion of the introduction of the bill to exclude the Duke of York from the succession. The opponents of the bill were called Tories, and from this time the name adhered to the court party, while their opponents were called Whigs. The doctrines of passive obedience and of the divine right of kings taught by the clergy of the Church of England ranked them as prominent supporters of the Tory party, so that Dr. Johnson defines a Tory as 'one who adheres to the ancient constitution of the state and the apostolical hierarchy of the Church of England'. The Tories are represented by the present Conservatives, who are still frequently spoken of as the Tory party—especially by political opponents.

TOTEM, a word of North American Indian origin denoting a class of animals, plants, or other natural objects which any particular group of savages regards with peculiar reverence or awe, and with which it conceives itself to stand in some intimate relation. Thus the members of the Emu clan of an Australian tribe believe themselves to be descended from the emu, and are regarded as forming a kind of blood-group in virtue of their common descent. No member is permitted to marry within the clan, and all the members are bound to support

one another in times of necessity. No Emu clansman will knowingly kill or eat an emu. Among some savage peoples the dead totem is elaborately mourned and carefully buried. Besides clan totems there are sex totems and individual totems. The totem having an important bearing on a person's relations to his fellows, it is shown conspicuously, being often tattooed on the skin or otherwise. The importance of totemism in relation to the social and religious institutions of savage peoples was first pointed out by J. F. McLennan in 1868, and much fresh light has been shed on the subject by subsequent investigators, but no satisfactory explanation of this curious system has yet been advanced. Totemism is almost universal in Australia and very common among the American Indians, among whom the institution seems to have been first specially noticed. It exists also amongst many African peoples, and numerous instances of it are to be met with in Asia and Polynesia. See works by McLennan, Tylor, Lubbock, Lang, Clodd, Robertson Smith, J. G. Frazer (*Totemism*, 1887), &c.

TOTNES, a borough and market-town of England, in Devonshire, beautifully situated on both banks of the river Dart, about 21 miles east by north of Plymouth, the Dart being here crossed by a bridge. The principal church of the borough is the Perpendicular St. Mary's, restored in 1886-89, and among the other buildings and institutions are: the guildhall, part of an old priory; market-house; grammar-school, founded in 1554, in which Dean Milman, Babbage, and other famous men were educated; a science and art school; and remains of an ancient castle. Pop. (1891), 4016; (1901), 4034.

TOUCAN (*Rhamphastos*), a genus of Scansorial or Climbing Birds, somewhat resembling the Hornbills (which see) in appearance, and belonging to the family Rhamphastidae. This group is distinguished by the large development of the bill, which is curved superiorly and bears a prominent keel. These birds inhabit tropical South America, live in large flocks in the forests, and feed on fruits, seeds, insects, &c. The substance of the large bill is hollowed out into air-cells, and thus rendered comparatively light; and the tongue is slender, and barbed along the sides. On Plate I. at ORNITHOLOGY is shown the Toco Toucan (*R. Toco*), which exhibits a deep black on the head and body, the bill ( $8\frac{1}{2}$  inches long) being orange, with a black base. The prevailing colours among the Toucans are yellow, black, and red. The bill is frequently very brilliantly coloured.

TOUCH. The structure of the skin and its papillæ having been already noted in the article SKIN (which see), it remains, in the present instance, to refer more particularly to the conditions under which the sense of touch is duly exercised. For the exercise of the sense of touch, filaments of the sensory nerves of the skin terminate in minute bodies, one variety of which is known by the name of *touch-corpuscles*. Through the medium of these an impression is by contact communicated to the nerve, and by it transmitted to the brain. Where these terminal organs are most abundant the sense is most acute. Thus the tips of the fingers, the lips, and the tongue are perhaps the most sensitive parts as regards the exercise of this sense, and in its intimate nature it is a very hard matter to exactly define the *rationale* of common sensation or touch. The sense itself may be variously exercised, as, for example, where a *pricking* sensation is felt—this latter effect being due probably to the sensitive impressions being limited in their intensity to a small surface or area. It would appear that the perfection of the exercise of this sense consists in, or may be demonstrated by, the power of distinguishing and recognizing the sensations pro-

duced by touching two small objects or points placed in close proximity. If, accordingly, the nerve fibres of a part are numerous, the part will be more sensitive, and will more readily isolate and distinguish the two points than another part which has fewer fibres. Valentin's experiments on the relative efficiency of various parts as organs of touch seem to prove that the tip of the third finger and the tip of the tongue are the most sensitive surfaces, since objects placed only  $\frac{1}{2}$  line apart can be distinguished by contact with these surfaces. The lips rank next in order, and objects or points placed  $1\frac{1}{2}$  line apart can thus be distinguished as separate and distinct points. The neck, middle of the back, and the middle of the arm and thigh, are the least acute surfaces. The sensation of touch appears to vary according to the extent of surface exercising the sense or which is exposed to the action of sensations. Thus if the whole hand be dipped into tepid water the temperature of the water will appear higher than when one finger only is immersed; and this result is observed even when the single finger is plunged into water of really higher temperature than that into which the entire hand is dipped. The distinct nature of the sense of touch, and the power of appreciating delicate impressions through this sense, probably depend greatly on the mental disposition of the individual, or primarily on the influence exerted by the mind in the appreciation of the sensation. Thus the actual *tactus eruditus* or cultivated touch is as much a quality dependent on the mental cultivation and action of the mind as upon the mere physical action of contact between certain surfaces and those of the skin; whilst trifling sensations, which are hardly or not at all noticed when the attention is diverted, may become almost of intolerable nature when the attention is concentrated upon them. Then also, and conversely, the mind appears to possess the power of reproducing sensations of touch, or of directly exciting the nerves of sensibility, apart from external influences or impressions. The cold, clammy touch which produces a feeling of horror in the person touched may long afterwards excite the same result by the mind reproducing the idea of the touch. The laws and states of *relativity* or *contrast* which so powerfully affect man's nature are well exemplified in the present instance. The sensation of cold, for example, is a relative sensation, in that it depends upon the previous state of the body. If we pass from a very heated room into a less warm atmosphere we feel chilled and cold in a degree which appears out of proportion to the temperature of the latter. Or if a severe pain mitigates its severity only in a slight degree a great relief is felt, even where the continuance of pain that remains is such as during health might itself be of intolerable kind.

**TOUCH-PAPER**, paper steeped in saltpetre, which burns slowly, and is used as a match for firing gunpowder, &c.

**TOUCHSTONE**, black basalt used for testing the quality of gold trinkets. A series of needles of which the composition is known are used for comparison with the article to be tested. When the colour of the streak produced by both the needle and the trinket on the basalt is the same the quantity of alloy they contain is supposed to be similar.

**TOUCHWOOD**. See **TINDER**.

**TOUL**, a town of France, in the department of Meurthe-et-Moselle, on the Moselle, here crossed by a bridge of seven arches, 12 miles west of Nancy. It is a place of some strength, being surrounded by walls flanked with bastions. It has a fine old cathedral, an old collegiate church, a town-house, college, barracks, &c., and manufactures of stoneware,

leather, and embroidery, the last employing more than 1000 hands. Toul was the seat of a bishopric as early as 410. It was taken in the Franco-German war after a siege of five weeks by the Duke of Mecklenburg, 23d Sept. 1870. Pop. (1896), 8942.

**TOULA**. See **TULA**.

**TOULON-SUR-MER**, a seaport town, and after Brest the most important naval arsenal of France, in the department of the Var, admirably situated at the bottom of a deep double bay of the Mediterranean, on a slope which ascends gradually from the sea. The bay, which is nearly land-locked, forms an excellent roadstead and harbour. In front of it is a tongue of land, which stretches across so as nearly to close its entrance, and along which, as well as the adjacent points, numerous forts and redoubts have been erected, making a successful attack by sea all but impossible. In like manner, on the land side, the fortifications are of the most complete description. In addition to the fortifications which surround the town strong forts and outworks occupy all the important heights, and complete the defences. In the town itself, if we except the arsenal and other marine establishments, which are on a scale of almost unrivalled magnificence, there is not much to excite interest. The port, which is separated from the roadstead by moles, which are hollow and bomb-proof, and lined by batteries *d'eau*, consists of two divisions—the Port Marchand, for merchant vessels; and the Port Militaire, surrounded by the dockyard, ship, arsenal, storehouses, cannon-foundry, park of artillery, &c. Neither the manufactures nor trade are of much importance, though the latter has increased considerably since the occupation of Algeria. Toulon owes its importance as a naval station to Louis XIV., who expended vast sums on it under the superintendence of Vauban. Pop. (1891), 74,134; (1901), 101,172.

**TOULOUSE** (the ancient *Tolosa Volcaurum*), a town of France, capital of the department of Haute-Garonne, finely situated on the Garonne, where it is joined by the Canals du Midi and Brienne, and on the trunk-line of railway which connects the Mediterranean with the Bay of Biscay. It is built chiefly on the right bank of the river, with the suburb of St. Cyprien on the left. It is almost entirely composed of clumsy antiquated houses of red brick badly cemented with clay and of a very gloomy appearance, and the streets are narrow, winding, ill paved, and dirty. The public buildings are in no way remarkable, though we may mention the cathedral, the Church of St. Sernin, the Hotel de Ville, the Museum, and the Palais de Justice. The manufactures consist of coarse woollen cloth and woollen covers, silk and printed cotton goods, vermoeilli, duck-liver pie, starch, wax candles, cutlery, stoneware, and porcelain. There are also numerous tanneries, a cannon-foundry, gunpowder and tobacco factories, dye-works, distilleries, cotton-mills, the first scythe manufactory in France, carriage, spring, file, and many other manufactures. The trade, general and transit, is important, being greatly favoured by the situation of the town, and facilitated both by water and railway communication. It is a place of great antiquity, and rose to eminence under the Romans, who embellished it with a capitol, amphitheatre, and other edifices, of which vestiges still remain. In the beginning of the fifth century the Visigoths became its masters, and made it the capital of their kingdom, which it continued to be till 508, when Clovis gained possession of it. Subsequently, under Charlemagne, it became the capital of Aquitaine. It was afterwards governed by independent counts, and in the thirteenth century fell a prey to the cruel bigots of the Inquisition, who here established



their infamous tribunal, and consigned multitudes of Albigenses to the flames as heretics. (See ALBIGENSES.) The most memorable event in its modern history is the defeat of the French by the British under its walls in 1814, while ignorant that, by the abdication of Bonaparte, hostilities had ceased. Pop. (1901), 147,696.

TOURAINÉ, an ancient province of France, bounded by Maine, Orleanais, Berry, Poitou, and Anjou; capital, Tours. It now forms the department of Indre-et-Loire.

TOURCOING, a town of France, department of the Nord, 9 miles N.N.E. of Lille, on the railway from Lille to Courtrai. It is a well-built, thriving, manufacturing town, the staple manufactures being woollen, cotton, linen, and silk stuffs, on a large scale; there are also dye-works, soap-works, sugar-refineries, &c. Pop. (1891), 65,477; (1901), 79,468.

TOURGUENIEFF, IVAN SERGUEEVITCH, a celebrated Russian novelist, was born at Orel, 28th Oct., 1818, and died near Paris, 3d Sept., 1883. He was the son of an officer of cuirassiers, who had him educated at Moscow, St. Petersburg, and Berlin. In 1842 he obtained an appointment in the ministry of the interior, but having written an article displeasing to the authorities he was shortly afterwards banished to his paternal estate. For some years he lived the life of a country gentleman, gaining thus an intimate knowledge of Russian peasant life. His first important publication was the *Tales of a Sportsman*, and this was followed by a great number of short tales and dramas, contributed chiefly to Russian periodicals. His earliest novel, *Dmitri Rudin*, was published in 1855, and this was followed by *Helene* (1858); *A Nest of Nobles* (1858), translated by Ralston under the name of *Liza; Fathers and Sons* (1861); *Smoke* (1865); *An Unfortunate* (1868); *Spring Floods* (1876); *Virgin Soil* (1877), besides a great number of short stories. With these works Tourguenieff established a European reputation as a literary artist of the first order, and aroused an interest in the social and political condition of Russia. After the Franco-German war of 1870 he resided chiefly in Paris.

TOURMALINE, one of the most interesting species in the mineral kingdom, on account of the forms of its crystals, its various and rich colours, its electrical properties, and its chemical composition. The general form of its crystals is a prism of three, six, or more sides, variously terminated at one or both extremities; when at both, the two terminations are dissimilar. The cleavage is rarely visible, and cannot be determined with certainty; fracture imperfect conchoidal, or uneven. The sides of the prism are deeply striated longitudinally; the terminal faces are generally smooth. Lustre vitreous; colour brown, green, blue, red, white, frequently black, generally dark; streak white; transparent to opaque; less transparent if viewed in a direction parallel to the axis than perpendicular to it, and generally presents different colours in these directions; hardness a little above that of quartz; specific gravity, 2.94 to 3.3. Besides the crystals, tourmaline is found massive, the composition being usually columnar; individuals of various sizes, thin, straight, parallel, or divergent. Long crystals of tourmaline assume, by heat, opposite kinds of electricity at their opposite extremities; and transparent pieces which have been cut and polished are electrical at common temperatures without friction or pressure. Transparent tourmalines transmit light only when polarized in a plane perpendicular to their principal axes; they are of great use in studying the properties of polarized light. (See POLARIZED LIGHT.) Tourmaline is a very abundant mineral in granitic rocks, occurring embedded in them in larger or smaller masses, sometimes occupying drusy cavities

of considerable extent. It exists also in beds, with augite, garnet, and various iron ores. It is also met with in pebbles in the sand of rivers. Tourmaline, when of a fine colour and transparent, is much esteemed as a gem. The rubellite or red varieties command the highest price; next to them the green ones, formerly called *Brazilian emerald*, are the most valuable; but they are less esteemed than real emeralds.

TOURNAI (in Flemish *Doornik*), a town of Belgium, in the province of Hainaut, on both sides of the Scheldt, which is here crossed by several handsome bridges and inclosed by fine quays planted with trees and forming excellent promenades. It consists in general of spacious streets and squares lined by well-built houses. Among the principal edifices are the cathedral, a very ancient structure of Romanesque and Ogival architecture; the Church of St. Brice, with the tomb of King Childeric adjoining; the ancient convent of St. Martin and its Gothic church, now used partly as a town-house, partly as a museum; the belfry, a lofty tower in the market-place, of unknown date; and a large and imposing building in the Renaissance style, formerly the cloth hall, but now a picture-gallery. The manufactures consist principally of woollen and cotton hosiery, carpets, porcelain, linen and cotton tissues, leather, and liqueurs. The trade is large. Tournai is one of the oldest towns of Belgium, and was the residence of some of the Frankish kings. Pop. (1900), 37,059.

TOURNAMENT, a common sport of the middle ages, in which mounted knights encountered each other with blunted lances and swords in order to display their skill in arms. The origin of tournaments is uncertain. They reached their full perfection in France in the ninth and tenth centuries, and first received the form under which they are known to us from the French. Tournaments were introduced into England soon after the Conquest by the Normans, who were passionately fond of this amusement. Jousts (French *joute*) differed from tournaments in being single combats between two knights, while tournaments were performed between two parties of cavaliers. Jousts were of two sorts—the *joute à outrance*, or mortal combat, generally between two knights of different nations; and the *joute à plaisance*, or joust of peace, which often took place after the conclusion of a tournament, but sometimes at times and places specially appointed for the purpose. Weapons of war were frequently used, even in this latter species of jousts; but blood was seldom shed in them. A favourite description of jousts was the *passage of arms*; a party of knights assembled at a certain place, and suspended each several shields of different colours, offering to combat any knight who should present himself. The comer touched the shield of that knight whom he wished to engage, and the nature of the combat and descriptions of arms to be employed were determined by the particular shield which he struck. Certain qualifications of birth were required for admission to the tourney, and their respective hostels, or tents, were assigned to the knights by the king-at-arms and heralds. The place of combat was the lists, a large open space surrounded by ropes or a railing. Galleries were erected around the lists for the spectators, among whom were seated the ladies, the supreme judges of tournaments. The weapons used by the knights were lances, with the points removed or covered with pieces of wood, and blunted swords. The tilting armour was of a light fabric, and generally adorned with some device of a lady's favour. Each knight was followed by his squire, who furnished him with arms, raised him if dismounted, &c. The prizes were delivered to the successful knights by the queen of beauty, who had been chosen by the



ladies. On the second day there was often a tournament for the esquires, and on the third a *mêlée* of knights and esquires in the lists. The great luxury and expense to which the tournaments gave rise frequently occasioned the prohibition of them by princes; and they were opposed also by the spiritual power on the ground of humanity. They gradually went out of use as chivalry declined. In France the death of Henry II., who was accidentally killed at a tournament by Count Montgomery in 1559, contributed to hasten their abolition; and they were little practised after the sixteenth century. Tournaments were succeeded by the *carrousel*, in which several parties of knights executed various evolutions, and mock combats and other shows were exhibited.

TOURNIQUET, an instrument employed in the practice of surgery to stop bleeding. It is applied to the limbs in cases of amputation, and its use is only intended to be temporary.

TOURS, a town of France, capital of the department of Indre-et-Loire, on the left bank of the Loire, on a flat tongue of land lying between this river and its tributary the Cher, 120 miles s.s.w. of Paris. The principal entrance to it is by a magnificent bridge across the Loire, 1423 feet long. The banks of the river are inclosed by a quay, lined with handsome houses and finely-planted promenades. Great part of the town is new, and many of the streets are spacious and elegant; but the older quarters are inferior. The principal edifice is the cathedral. Its west front consists of three lofty portals covered over with florid ornaments, surmounted by a window of astonishing dimensions, and flanked by two domed towers, 205 feet high. The interior, which is of the purest Gothic, and lighted by beautifully-stained glass, is 256 feet in length and 85 feet in height. There are two towers which form conspicuous objects from every part of the town, the one called the tower of St. Martin or Horloge, from containing the principal clock; the other the tower of Charlemagne, because his queen Luitgarde was buried below it; and both remarkable as the only relics which the revolutions of 1793 have left of the vast cathedral of St. Martin of Tours, after it had flourished for twelve centuries. The archiepiscopal palace is regarded as one of the most handsome in the kingdom. The manufactures consist of silk stuffs, ribbons, broad-cloth, serge, rugs, chemicals, and leather; and the trade is in corn, wine, brandy, dried fruits, wax, hemp, wool, &c. Tours early acquired considerable importance, and under the Romans was known by the name of *Cæsarodunum*. In modern times it became famous for its silk manufactures, and had so extended as to have a population of 80,000, when the revocation of the Edict of Nantes deprived it of nearly half its inhabitants, and almost all its industry, and inflicted a blow on its prosperity from which it has never recovered. In the neighbourhood, about 1 mile west of the town, is the castellated den of Plessis-les-Tours, of which an admirable description is given by Scott in his *Quentin Durward*. During the Franco-German war Tours was made the seat of the government delegation during the siege of Paris, on 12th September, 1870. The delegation removed to Bordeaux on 10th December. Tours surrendered to the Germans on 21st December, and was occupied on 20th January, 1871. Pop. (1891), 60,335; (1901), 64,448.

TOUSSAINT-LOUVERTURE, a distinguished negro, born a slave in the Island of Hayti in 1743. When the insurrection of the blacks broke out in 1791 Toussaint took service in the army of the blacks, but not till he had assisted his master to escape. He rose quickly in the army, being in 1793 a general of division. In this position he displayed

much military as well as political ability, and rendered valuable services to the French Republic against the British troops which had been landed on the island. In 1796 the French government made him general-in-chief of the troops in San Domingo, and as such he signed the convention with General Maitland for the evacuation of the island by the British. He now assumed sovereign authority, but it was only after a severe struggle against insurrectionary movements that he was able firmly to establish his position. In 1801, on the submission of the Spanish forts, he was completely master of the island. He now framed a constitution by which he was appointed president for life of the Republic of Hayti, with the right to name his successor. He was simple and abstemious in his own habits, but affected great magnificence in his surroundings, and exacted a rigorous court etiquette. By his vigorous government the commerce as well as the agriculture of the island began to revive. After the Peace of Amiens Napoleon sent a powerful expedition under his brother-in-law Leclerc to subdue Toussaint, who after a struggle was forced to surrender, and on his oath of fidelity was permitted to retire to his estate. He was afterwards detected conspiring against the French, and being seized by a somewhat unworthy stratagem, was sent to France, where he died in prison, 27th April, 1803. At the time a suspicion of poisoning was general, but there is no evidence to support it.

TOWER OF LONDON. This celebrated fortress consists of a collection of buildings of various ages on a somewhat elevated position on the north bank of the Thames, outside the old city walls. The ground on which it stands is of an irregular form, nearly square, and measures about 13 acres. It is encircled by a moat, now usually dry, and surrounded by a battlemented wall flanked with massive towers, within which is an inner line of circumvallation also broken by towers, and interspersed with other buildings. In the middle of the inclosure rises the large square White Tower, the keep of the old fortress, around which are irregularly grouped the chapel, the jewel-house, the barracks, the ordnance store houses, and other buildings. The Tower was a first-class medieval fortress, and served at once as a palace, a prison, and a place of defence. It is now of no value as a place of military strength. The White Tower was erected by Gundulf, bishop of Rochester, for William I. in 1078. It was used as a state prison soon after its foundation, and was employed as an arsenal about the beginning of the thirteenth century. It was successively strengthened by various English sovereigns, the moat and outer wall being ascribed to Bishop Longchamp, who held the Tower against Prince John in 1190. A menagerie was first formed in the Tower about 1235. It was last occupied as a royal residence by James I. in 1604. The menagerie was removed to the Zoological Gardens in 1831. The state papers were deposited in the Tower till 1857, when they were removed. A great fire broke out here in 1841, which did much damage in the armoury. The regalia are now kept in the Record Tower, where they are exhibited to the public. The Tower is now chiefly used as an arsenal, and has a small military garrison, belonging to the yeomen of the guard. It is governed by a constable and deputy-constable. The governorship is still a post of distinction. The last political offenders executed on Tower Hill were the Scotch lords convicted of participation in the rebellion of 1745. Some damage was done to the White Tower on the 24th January, 1885, by an explosion, the work of Irish dynamitards.

TOWN. See CITY.

**TOWN-CLERK**, the clerk to a municipal corporation. In England and the United States his duties are for the most part those of a mere servant of the corporation which elects him, and he holds his office during pleasure. In Scotland, on the other hand, he has a variety of duties imposed on him, in which he acts independently of the council, and in order that he may be free in these cases from the interference of the council his situation is secured to him for life or until the commission by him of a serious fault. He is the legal adviser of the council, and the custodian of the burgh records, from which he is bound to give extracts when required to do so.

**TOWN-COUNCIL.** See **BOROUGH** and **BURGH**.

**TOWNSHIP**, in England, the earliest administrative unit of the country, often coinciding in area with the parish, otherwise forming a part of it; the parish being an ecclesiastical division, which the township is not.

**TOWTON**, a village of England, in Yorkshire, 3 miles south-east of Tadcaster. A sanguinary battle was fought here between the forces of the houses of York and Lancaster in 1461, in which the latter were completely defeated. See **EDWARD IV**.

**TOXICOLOGY**, the science of poisons and antidotes. See **POISON**.

**TOXOTES**, a curious genus of Fishes, represented by the Archer or Shooting Fish (*Toxotes jaculator*), found in the East Indian Seas, and noted for its habit of shooting drops of water from its mouth at flies and other insects, and of thus causing its prey to fall into the water.

**TRACERY**, the ornamental stone-work in the head of a Gothic window, arising from the mullions, and presenting various combinations of curved or straight lines.

**TRACHEA**, or **WINDPIPE**, the name given to the tube extending from the larynx (which see), or organ of voice, to a point opposite the third dorsal vertebra, where the tube divides into two chief divisions or bronchi, one of which supplies each lung with the air necessary for respiration or breathing. The trachea is of cylindrical form, and is both membranous and cartilaginous in its nature. Its length is about  $4\frac{1}{2}$  inches, and its diameter from  $\frac{3}{4}$  inch to 1 inch; that of the male being of greater diameter than the female. The front, or anterior surface of the organ, is convex, and is covered in the neck and chest by various structures, including the isthmus of the thyroid gland, the inferior thyroid veins, the sterno-hyoid and sterno-thyroid muscles, the first part of the sternum, the arch of the aorta, &c. The windpipe rests on the gullet or œsophagus, whilst in the chest it is situated between the pleure or membranes lining the thorax, and has the pneumogastric nerve on each side. The windpipe is composed of rings or zones of gristly or cartilaginous nature, known as the *cartilages* of the trachea, and numbering from sixteen to twenty. Each cartilage, in fact, forms an imperfect ring, being unclosed behind, and having the gristly edges merely joined by fibrous membrane. The cartilages are separated from each other, and also connected together, by narrow bands of fibrous tissue. The first cartilage of the trachea is broader than the others, and may be divided at one extremity, whilst the last cartilage is thick in the middle, and curved backwards at the point where the windpipe divides into the two bronchi. Sometimes two of the cartilages of the windpipe may unite. The muscular fibres of the windpipe exist in longitudinal and transverse layers, and are composed of unstriped or non-striated fibres. (See **MUSCLE**.) The windpipe itself is lined by delicate mucous membrane, which is covered by epithelial cells provided with delicate vibratile processes or *cilia*. The

trachea derives its blood from the inferior thyroid arteries. Its nerves arise from the pneumogastric trunks and recurrent branches as well as from the sympathetic system. Certain glands, named *tracheal glands*, exist at the hinder part of the windpipe. These latter are small oval bodies, which are probably modifications of ordinary mucous glands, and which serve to lubricate by their secretion the internal surface of the organ. All Mammals, Reptilia, and Birds possess a trachea, but some Amphibia (such as Frogs and Toads) want this organ; the lungs in such cases springing directly from the larynx or organ of voice. In birds (see **ORNITHOLOGY**) the trachea attains its greatest length, and may be greatly contorted. In birds generally, the cartilages of the trachea are not incomplete, as in man, but completely encircle the tube, and (as often seen in human old age) are usually of bony nature.

**TRACHEOTOMY**, **LARYNGOTOMY**, or **BRONCHOTOMY**, an operation in which an opening is made into the larynx or windpipe, either for the purpose of making a passage for the air into and out of the lungs, when any disease prevents the patient from breathing through the mouth and nostrils, or of extracting foreign bodies which have accidentally fallen into the windpipe; or lastly, in order to be able to inflate the lungs, in cases of sudden suffocation, drowning, &c. Its practicableness and comparative safety are founded on the facility with which certain wounds of the windpipe, even of the most complicated kind, have been healed, without leaving any ill effects whatever, and on the nature of the parts cut, which are not furnished with any vessel of consequence.

**TRACHYTE** (Greek *trachys*, rough), a volcanic igneous rock, rough to the touch (whence the name), generally of a light-gray colour, but sometimes brown or otherwise coloured, consisting essentially of sanidine felspar, with one or two (rarely all three) of the minerals augite, hornblende, and magnetite. It often shows a porphyritic structure, and in districts where volcanoes are or have been active it occurs as a lava (*trachyte-lava*).

**TRACTARIANISM**, the name usually given to a system of religious opinion and practice promulgated within the Church of England in a series of papers published under the title of *Tracts for the Times*, between September, 1833, and March, 1841. These papers owed their origin to a feeling of alarm in the minds of the writers for the safety of the Church of England, a feeling produced by various recent acts of the legislature such as Roman Catholic emancipation and the re-distribution of political power by the reform act of 1832. It was feared that these measures might result in a union between the Roman Catholics and the Protestant non-conformists for the overthrow of the Established Church. The immediate object of the writers seems to have been to rouse a large number of nominal adherents of the Church of England from their apathy, by awakening their interest in what the writers conceived to be the distinctive principles of that church. For this end they sought to mark out a middle way between Romanism and what they called ultra-Protestantism. The leaders in this movement were J. H. Newman, John Keble, and E. B. Pusey, and they were assisted by not a few devoted adherents, such as R. H. Froude (brother of the historian), Hook, Palmer, Perceval, Isaac Williams, and others. In the first stage of the movement little else was attempted than the inculcation of the peculiar and exclusive powers of ministers episcopally ordained by the laying on of hands in a direct and unbroken line from the apostles; and it was not till the publication in 1838 of the *Remains of R. H. Froude*, under the joint-editorship of Newman and Keble, that any

suspicion was created in the public mind of the ultimate tendencies of the movement. The volumes published under that title were pervaded by an unmistakably anti-Protestant spirit, and the fact of their being edited and defended (as they afterwards were) by two who were known to be leaders in the Tractarian movement caused that movement to be denounced by many who had hitherto treated it with indifference or forbearance, or had even bestowed upon it a certain measure of approval. From that date the bishops commenced a series of charges all bearing more or less strongly against the authors of the tracts, and treating them not as heretics but as disturbers of the church. Still the movement went on more actively than ever. A multitude of controversial writings appeared on both sides, and the tracts gradually showed more and more of a leaning to the Roman Catholic Church. At last, in Tract No. 90, written by Mr. Newman, and published in March, 1841, an attempt was made to prove, as the Jesuit Francis or Santa Clara had formerly tried to do, that there is no insurmountable barrier between the Roman Catholic and the Anglican communions; that the thirty-nine articles, although prepared by Protestants, are susceptible of a Catholic interpretation not inconsistent with the doctrines of the Council of Trent. On the 15th of the same month the hebdomadal board of the University of Oxford condemned the tract as teaching a mode of interpreting the thirty-nine articles inconsistent with the statutes of the university, and the bishop of the diocese of Oxford recommended that the series of tracts should terminate with that number, which it did. A few years later (1845) Newman went over to the Church of Rome, as several of the other partakers in the movement had done before him. The effects of the movement can still be traced within the English Church in the extreme development of ritualism in a section of the High Church party. See Church's *The Oxford Movement*; Liddon's *Life of Pusey*; Ward's *William George Ward and the Oxford Movement*, and W. G. Ward and the Catholic Revival.

**TRACTION-ENGINE.** See **LOCOMOTIVE** and **STEAM-ENGINE**.

**TRADE, BOARD OF.** See **BOARD OF TRADE**.

**TRADE-MARKS,** marks used by a manufacturer or a merchant to distinguish his own goods from those of other persons. The law relating to this subject in Great Britain is regulated by various acts, some of them quite recent. According to present regulations trade-marks must be duly registered at the patent office, one of the chief officials of which is the registrar of designs and trade-marks. By the act of 1888 a trade-mark is defined as consisting of one or more of the following essential particulars: (a) a name of an individual or firm printed, impressed, or woven in some distinctive manner; (b) a written signature or copy of a written signature of an individual or firm; (c) a distinctive device, mark, brand, heading, label, or ticket; (d) an invented word or words; (e) a word or words not referring to the character or quality of the goods and not being a geographical name. To any one or more of these particulars there may be added any letters, words, or figures, or combination thereof; but the applicant must state his essential particulars and disclaim right to the exclusive use of any merely added matter. No proceeding may be taken to prevent the infringement of a trade-mark unless such trade-mark be registered. A trade-mark must be registered as belonging to particular goods or classes of goods. By the *Merchandise Marks Act* (1887) it is enacted that any person who forges any trade-mark; who applies to goods any trade-mark so similar as to

be apt to deceive; who makes or disposes of any die, block, machine, &c., for forging a trade-mark; or who exposes for sale any goods bearing a forged trade-mark; the same is liable on conviction on indictment to imprisonment for two years, and on summary conviction to four months' imprisonment or a fine of £20 for first offence.

**TRADES-UNIONS.** A trade society was defined in the report of the Social Science Committee on the subject appointed at Bradford, in 1859, as 'a combination of workmen to enable each to secure the conditions most favourable for labour'; and although trades-unions, as they are generally called, almost always have other objects in view in addition to that specified in the definition, that object is their distinguishing one. Combinations of this sort in Great Britain are considerably more than three centuries old, for there is a statute of the year 1548 expressly directed against them. The principle of legislation regarding the relations of masters and workmen in England down to the beginning of the nineteenth century was that the rate of wages should be determined from year to year by the magistrates. This was particularly the case as to the wool trade, the acts regulating which in the manner indicated were only repealed in 1809, previous to which date they had been for some time suspended. Even before that date, as many magistrates had habitually neglected the duties imposed on them by the legislature in respect of workmen's wages, the men had often formed combinations for self-protection, but such combinations were always illegal and therefore secret. After the total repeal of the acts relating to the wool trade these secret combinations became much more common, and in 1824 the laws against such combinations were repealed, in consequence of which trades-unions multiplied very rapidly. The Trade Union Act of 1871 gave them a greatly improved status, and other acts tending in the same direction have been passed since. By a decision of the House of Lords in 1901 it has been settled that a trades-union is a corporation, and that it may be sued as such and its funds made liable for damages. The following methods are those by which trades-unions generally aim at accomplishing their main object:—1, Issuing periodically a view of the state of trade throughout the country; 2, keeping registers of men in search of work and masters in want of men; 3, assisting men in search of work from town to town, and occasionally helping to furnish the means of emigrating; 4, regulating the number of apprentices; 5, maintaining men in resistance to employers; 6, regulating the working hours and drawing up trade rules; 7, organizing strikes. The success of trades-unions generally in effecting their main object of improving the conditions of labour, and the reasonableness of some of their methods, have been much disputed. As to their general results, although it is impossible to attribute the greatly improved condition of the working-classes within the last half-century wholly, or even in great part, to the influence of trades-unions, yet it can scarcely be doubted that such combinations give the men a power of reaping the advantages to be derived from the prosperity of their trade more readily and perhaps more completely than they could have done without them. It is, of course, well understood, and that too, generally, by the workmen themselves (thanks chiefly to trades-unions), that such combinations are powerless to force up wages independently of the state of the trade; but when the state of trade admits of a rise of wages the demand of a union for an increase must obviously be more effective than that of individual workmen, and is likely to obtain the increase for the men sooner than the operation of supply and demand.

That trades-unions also enable the men to benefit by the state of trade more than they otherwise would have done would appear from the fact, which is said to be established, that the worst paid trades are those without unions. Trades-unions are also said to have done a great deal towards increasing the safety of the labourer by procuring modifications of the conditions in which he works. As to the methods of trades-unions, the utility of strikes is what has been especially questioned. It is sometimes asserted that the gains that have come to the workmen through successful strikes do not compensate the losses incurred in the struggles, and that the loss is very great on the side of the workmen when the unsuccessful strikes are taken into account. But it must be remembered that strikes have not always owed their origin to trades-unions, and that now, on the contrary, trades-unions, instructed by former experience, often use their influence to check inconsiderate striking. And it should also be remembered that the utility of striking cannot be fairly estimated by the mere balance of loss and gain in the strikes that have actually taken place. The practice of striking has no doubt taught the masters as well as the men a salutary lesson, and has made the former less ready to resist the men's demands when these demands are reasonable. Much hostility against trades-unions has been produced by the outrages of a more or less serious nature of which some of the unions have undoubtedly been guilty. The most common of these outrages is what is called 'ratting'; that is, depriving a workman who has rendered himself obnoxious to his union, of his tools, and keeping them until the workman has made amends to the union for his offence. The intimidation of non-unionists who venture to take work where the men are out on strike is also a common practice. So frequent did such outrages become that special legislation had to be made regarding them (38 and 39 Victoria, cap. lxxx. s. 7). The number of unionists among the working-classes is by no means so large as is often supposed. There are many trades that have no union at all, and even in those which have unions the unionists are often in a minority. In 1900, however, there were 1272 trades-unions in Britain, with a total membership of 1,905,116. The income of 100 of the chief unions amounted to a total of £1,974,611, the accumulated funds being £3,766,625. See Webb's *History of Trade Unionism* (1894) and *Industrial Democracy* (1897).

**TRADE-WINDS.** See **WIND**, and the articles on the ATLANTIC, INDIAN, and PACIFIC OCEANS.

**TRADITION**, any knowledge handed down from one generation to another by oral communication. It plays a very important part in the Jewish and Roman Catholic Churches. For an account of the position it holds in the first, see TALMUD and the articles referred to there; and for that which it holds in the second, see INFALLIBILITY.

**TRADUCIANS** (from *traduco*, transmit), a name which the Pelagians anciently gave to the Catholics, because of their teaching that original sin was transmitted from father to children. More commonly the term is applied to the theory first propounded by Tertullian that souls are transmitted to children by the parents. See **MIND**.

**TRAFALGAR**, a cape on the south-west coast of Spain, at the north-west entrance of the Strait of Gibraltar. It is low and sandy, and terminates in two headlands, on the east of which is a round tower. The famous naval battle in which Nelson lost his life, after defeating the combined French and Spanish fleets under the command of Villeneuve and Gravina, was fought off this cape, October 21, 1805.

**TRAGEDY.** See **DRAMA**.

**TRAGOPAN.** See **PHEASANT**.

**TRAGULUS**, an interesting genus of Ruminant Quadrupeds, by some zoologists included in the family Moschidae or Musk-deers (which see), and by others made the type of a distinct family, that of the Tragulidae. The most familiar species of this genus is the *Tragulus pygmaeus* or Kanchi, sometimes also known as the Pigmy Musk-deer, the smallest known ruminant. It occurs in the Eastern Archipelago, where it inhabits thick forests. It is very wary and cunning; and is said to feign death when caught, and to frequently escape through this ruse. As a genus the Traguli are known by the hairless chin and throat.

**TRAINING, ATHLETIC.** The main requisite in athletic training is to get rid of all superfluous flesh, which consists chiefly of the fatty tissue of the body. This is chiefly effected by perspiration induced by violent exercise and warm clothing, or sometimes now-a-days by the use of the Turkish bath. The length of time during which the training must be continued depends of course greatly on the condition of the person undergoing the process. One who has been accustomed to a life in the open air with plenty of exercise, will put himself in proper condition in much less time than one whose pursuits up to the time of his commencing training have been sedentary. During all the time that the training is going on the person trained must adhere to a strictly regulated diet both as to eating and drinking. The slightest unwarrantable indulgence would completely undo the effects of much hard labour. Almost the same methods of training are pursued with animals as with men, but in their case much less training is required to bring them into condition.

**TRAJAN** (Lat. *Marcus Ulpius Trajanus*), a Roman emperor, born in Italica (near Seville), in the Spanish province of Betica, in the year 52 A.D., was the son of Trajanus, a distinguished Roman commander under Vespasian. He accompanied his father in a campaign against the Parthians, and also served on the Rhine, where he acquired so high a character that when the excellent and aged Nerva came to the throne he adopted him and raised him to the rank of Cæsar in 97. His elevation immediately curbed the insolence of the prætorian guards; and Nerva dying a few months after, he peaceably succeeded to the throne (98). He was at that time in Germany, where he remained for more than a year, to settle a peace with the German tribes, and in 99 set out with a numerous escort to Rome. After a liberal largess to the soldiers and people he took measures for supplying the capital with corn, in which he was eminently successful. He then proceeded to punish and banish the pernicious tribe of informers, and to reduce some of the most odious of the taxes, and showed the most praiseworthy solicitude to fill the most important posts with men of talent and integrity. Although his early military life had prevented him from acquiring the accomplishments of learning, he was sensible of its importance, and founded libraries; and under his patronage the studies were revived which had suffered from the persecution of Domitian. His virtues procured for him, by the unanimous voice of the senate, the title of Optimus. In 101 he set out on an expedition against Decebalus, king of the Dacians, who had forced Domitian to purchase peace by an annual payment of money. The war lasted for about two years, and ended in the defeat of the Dacians. Trajan then returned to Rome and enjoyed the honours of a triumph with the name of *Dacicus* (103). In this year Pliny was made governor of Pontus and Bithynia, which circumstance gave rise to a series of official letters between him and Trajan still extant. Among these are the famous epistles

respecting the Christians, whom he directs Pliny not to search for, but to punish if brought before him; and on no account to listen to anonymous charges. In 104 Decebalus renewed the war with the Romans, which immediately called out the warlike emperor, who, with a view to form a road for his troops, constructed a bridge over the Danube, below the modern Orsova, which was deemed one of the greatest works of antiquity (105). He then marched into Dacia, and reduced the capital of Decebalus, who, in despair, killed himself; and Dacia became a Roman province. It is supposed that it was in commemoration of his wars in Dacia that he erected the column sculptured with his exploits which still remains under his name. After this war Trajan occupied himself continuously with the work of administration for some years. The year 114 is said to be that in which he dedicated the magnificent forum that he built in Rome, and in that year he set out on a new warlike expedition. The disposal of the crown of Armenia led, in the first instance, to a contest with Chosroes, the Parthian, of which war the reduction of Armenia to a Roman province was the result. His war with the Parthians was completed in two campaigns, after which he sailed down the Tigris and entered the Persian Gulf. During his absence the Parthians revolted. After giving a king to the Parthians he laid siege to Atræ, the capital of an Arabian tribe, but was obliged to withdraw to Syria. In the following year (117) he proposed returning into Mesopotamia, but was attacked by a disorder, which induced him to repair to Italy, leaving the army under the command of Hadrian. He had proceeded no farther than Selinus, in Cilicia, when he died, after having adopted Hadrian for his successor. Trajan died in his sixty-fourth year, after a reign of nearly twenty years. In his private character he was said to be addicted to sensual indulgences. His good qualities as a ruler, however, were such that, at the distance of 250 years from his death, the senators, in their acclamations on the accession of a new emperor, were accustomed to wish that he might be more fortunate than Augustus and better than Trajan.

**TRAJAN'S COLUMN.** See **ROME**.

**TRALEE**, a market-town and seaport in Ireland, in the county of Kerry, on the river Lee, 55 miles south-west of Limerick. It has several spacious and well-kept streets, and an active trade in farm produce. By means of a canal vessels up to 300 tons can discharge their cargoes within 100 yards of the town. Pop. (1891), 9318; (1901), 9867.

**TRAMWAY**, a variety of railway specially adapted for passenger traffic on the streets of towns or for facilitating communication between a town and its suburbs. A tramway or street-railway necessarily differs considerably from a railway in the strict sense of the term. The rails must be so laid as not to interfere with the general traffic, and the points must be of much simpler construction, with the fewest possible movable parts. The speed of the cars must, of course, be much less, under most circumstances, than that of railway trains, and the emission of smoke or steam is not permissible. The cars, moreover, must run at short intervals, and must stop either when required or at least frequently. The gauge of tramway lines is mostly the same as the normal gauge of railway lines. Formerly the rails were of iron and rested on wooden sleepers, but this system was deficient both in firmness and in permanence. Steel is now used for tramway rails, and they are supported on a bed of road-metal or coarse sand so as to be on a level with the surface of the street. Flanges on the wheels of the cars serve to keep them on the rails.

Until recently street tramways were propelled chiefly by horses, but the great superiority of mechanical traction has almost wholly displaced the horse for work of this kind. In several cities steam is the motive power adopted, but in such cases it is necessary to provide means for consuming the smoke and condensing the steam. The Roman steam-car is one of the principal vehicles of this type. Fireless steam-cars have also been devised. Compressed air was successfully used as a motive power in street tramways in Nantes in 1881, and it has since been introduced elsewhere. Street cars driven by gas motors were first tried in 1885 in Melbourne, and several tram lines with gas power have been laid down in Germany in recent years. Cable-cars were introduced in San Francisco, a city with very steep gradients, by Andrew Hallidie, in 1873, and this system is in operation also in Cincinnati, Denver, St. Paul, St. Louis, and other American cities, as well as in some cities of the Old World, such as Edinburgh. An endless wire cable is kept running on pulleys in an iron tube, beneath the level of the street and midway between the rails, by a stationary engine at the power station. Each car is provided with a bar which can be let down into the tube through a slit in the upper part, and this bar can be firmly fixed to the cable by the driver when required. All these forms of mechanical traction, however, are now of less importance than electric traction, which bids fair to drive them all from the field. The first successful application of electricity as a tramway motive power was made by Siemens and Halske near Berlin in 1881. Three systems are now in use, namely, the overhead trolley system, which necessitates an elaborate erection of supporting poles and overhead wires; the underground trolley system; and the accumulator system. The last is the best from a theoretical stand-point, because with it each car has its own power and is not dependent on the continuous working of a current from a power station; but the imperfections of the present accumulators, particularly their great weight, have hitherto stood in the way of its general adoption. The underground trolley system has been introduced in London, New York, and Washington, but at present the prevailing method of applying electricity to the propulsion of cars is by means of overhead wires and trolleys. (See **ELECTRIC RAILWAYS** in SUPP.)

Street cars have mostly two decks, one protected from weather and one exposed, but one-decked cars are also in use. They are generally entered from the ends, but some are entered from the middle. Sometimes the fares are deposited by the passengers in a box, but usually they are collected by the conductor. In most large American cities and in some Continental cities there is a uniform fare for any distance, and in not a few places (Stockholm, New York, San Francisco, St. Paul, &c.) transfer tickets are obtainable with or without extra charge.

The first tramway was constructed in New York in 1831, and the first tramway in the United Kingdom was the Birkenhead one of 1860. The first French line was laid down in Paris in 1853. In 1898 Boston (U.S.A.) opened a subway for her electric cars, and at some points of the route there are even sub-subways. Most of the larger municipalities of the United Kingdom own and control the tramways within and even beyond their municipal limits. There are now about 1200 miles of road and street tramways in the United Kingdom, with an annual income of over £5,500,000 and an annual expenditure of over £4,000,000. The total number of passengers carried in a year is about 1,100,000,000.

**TRANCE**, an ecstasy, a state in which the voluntary functions of the body are suspended, and in which a dream life is carried on of more coherency than in ordinary sleep. In some cases the only external sign of trance is the length of time during which the voluntary functions are suspended. The patient is then said to be in a trance-sleep. When the trance is deeper the action of the heart and lungs is very feeble although perceptible; the state of the patient is distinguished as that of trance-coma. And when the trance is so deep that the action of the heart and lungs becomes altogether imperceptible, the body falls in temperature and no sustenance is taken, the patient is said to be in a death-trance. The state of trance is usually a consequence of violent emotion or excitement, especially of a religious nature. By those who have fallen into such a state in consequence of religious excitement the dreams then experienced by them are often taken for revelations from another world. For the state of apparent death which sometimes takes place to such a degree as to have led to the interment of people under the supposition that death had actually taken place, see **ASPHYXIA** and **DEATH**; and for the means of restoring suspended animation, see **DROWNING**.

**TRANI**, a town and seaport of South Italy, in the province of Bari, on the Adriatic, 26 miles N.W. of Bari. The principal edifices are the cathedral (twelfth century), with a large crypt and fine bronze doors, and the castle, now used as a prison. The old fortifications have been replaced by promenades. The trade consists chiefly in oil, grain, almonds, figs, and excellent wine. Trani was an important town in the period of the Crusades, and since the eleventh century it has been the see of an archbishop. Pop. about 25,000.

**TRANQUEBAR**, a seaport of India, in Madras, district of Tanjore, 56 miles south of Pondicherry. It stands between two arms of the river Cavery, and is surrounded by ramparts faced with masonry, and having at the south-east angle the citadel of Danneborg, now used as a prison. The town is neatly built; and there are two Protestant churches, a Portuguese chapel, and Danish, English, and Portuguese schools. Some manufactures of coarse cottons, &c., are carried on. The railways in the district have diverted its trade. It was the first settlement of Protestant missionaries in India. It was made a Danish settlement in 1616, and sold to the British in 1845. Pop., with the native suburb of Poraiyár, 14,468.

**TRANSCAUCASIA**. See **CAUCASUS**.

**TRANSCENDENT** and **TRANSCENDENTAL** are technical terms in philosophy. According to their etymology (from *transcendere*) they signify that which goes beyond a certain limit; in philosophy, that which goes beyond or transcends the circle of experience, or of what is perceptible by the senses. The latter sort are called, in a narrower sense, *pure* or *transcendental*.

**TRANSEPT**. See **ARCHITECTURE**.

**TRANSFUSION** (*transfusio*, from *transfundo*, to pour from one vessel into another), the transmission of blood from the veins of one living animal to those of another, or from those of a man or one of the lower animals into a man. This operation, performed with the view of restoring the vigour of exhausted subjects, is a very old one. It was performed without success on Pope Innocent VIII. in 1492. It was resorted to in France by Denys and Emeres in the seventeenth century, but the bad success of some of their operations led to the proscription of the practice by the Parliament of Paris in 1668, and for a long time the operation was altogether given up. It has, however, been reintroduced into modern surgery, and with a

great amount of success. Probably the failures in former times were occasioned by a want of due precautions to exclude the air when transfusing the blood from one person to another, perhaps also from the blood of animals being used. The operation being dangerous is only to be tried after other means have failed, and is employed in cases of great loss of blood by hemorrhage or other causes, principally in connection with labour. Full details regarding the mode of performing the operation are to be found in Dr. Playfair's Handbook of Obstetric Operations (London, 1865).

**TRANSIT**, the passage of a heavenly body across the meridian; the passage of one heavenly body across the disc of another. See **VENUS**.

**TRANSIT INSTRUMENT**, a telescope adapted for observing the passage of heavenly bodies across the meridian. A transit telescope has a transverse axis on which it is free to rotate in bearings solidly supported on stone pillars. The line of collimation (the line joining the optical centre of the object-glass with the central intersecting cross wires in the principal focus) must be adjusted at right angles to the axis of rotation, so that this line will describe a plane when the instrument is moved; and the bearings of the axis must be so placed that the plane described will be the plane of the meridian. In the principal focus of the object-glass an arrangement of six single fibres of silk exists; one of these fibres is horizontal, and five others placed at equal distances apart cross it at right angles. In using the instrument, when a star is seen to cross the intersection of the middle wires the time by the observatory clock is noted; a graduated circle attached to the instrument gives the altitude of the star. A small lamp is attached to the side of the telescope tube to throw light against the cross-wires, so that they may be seen through the eye-piece.

**TRANSMIGRATION OF THE SOUL**, or **METEMPSYCHOSIS**, the passage which, according to the belief of many races and tribes at all times, the soul after the death of the body makes through the bodies of the lower animals or other human bodies, or, it may be, through plants or inanimate objects. Among various tribes of Africa and America the belief is found entirely unconnected, so far as can now be discovered, with any ethical notions. In the teaching of the Brahmanic Hindus, among whom the doctrine can be traced further back than in any other race, it has its foundation in the belief of the connection of all living beings, and of the gradual purification of the spiritual part of man and its return to the common source and origin of all things—God. By them the migration of a human soul through various bodies is regarded partly as a penance and partly as a means of purification. The doctrine of transmigration is accepted by the Buddhists also, but with them the ultimate goal of the soul is not absorption in the Deity, but annihilation, Nirvana. The southern Buddhists hold the doctrine with another important difference. They do not believe that one soul undergoes a variety of migrations, but that after the death of the body another soul which derives its existence from the one that inhabited that body begins its life in another body. With this doctrine is connected the regard which the Indians have for animals. The doctrine also formed part of the secret teaching of the Egyptian priests, who believed that the soul had to continue 3000 years after death in the bodies of animals before it could reach the habitations of the blessed. It was probably from the Egyptians that the doctrine passed to the Greeks, among whom it was never generally current, but was confined to the mysteries and some philosophic systems. Pythagoras is the first Greek philosopher in



whose system the doctrine occupied an important place, but Thales and Pherecydes are both said to have preceded him in teaching it. Plato in his *Phædo* advances some probable arguments in favour of the doctrine, propounding the speculation that souls return into the Godhead after a cycle of 10,000 years, during which they have to abide in the bodies of animals and men. Plotinus treats of two kinds of transmigrations, a passage of souls from invisible ethereal bodies into earthly ones, and from earthly into other earthly bodies. Among the Romans, Cicero alludes to this doctrine, and Virgil, and more especially Ovid, in many passages give it a poetical treatment. Cæsar informs us, that it was believed in by the Gauls, who, he says, in this faith were able to despise death. The doctrine is also found in the Talmud, but only a minority of the Jewish rabbis appear to have adopted it. They treat the subject of transmigration in their peculiar way, maintaining that God created but a certain number of Jewish souls, which therefore constantly return on earth as long as Jews are to be found here, and are sometimes made to dwell in the bodies of animals for the sake of penance, but at the day of the resurrection will all be purified, and in the bodies of the just revive on the soil of the promised land. The doctrine of the transmigration of souls has also been held by various heretical Christian sects, for example, by the Carpocratians, Valentinians, and Manichæans. It was also professed by the Arabs before Mohammed, but was not admitted by him into the Koran. Even some modern European writers have inclined to this doctrine. Among these may be mentioned Lessing in Germany, and Pierre Leroux and Jean Reynaud in France. The reasoning of Lessing in support of the doctrine amounts to this, that the human soul can acquire the infinite conceptions of which it is capable only in an infinite series of successive existences, that the soul in one condition may supply the deficiencies of another, and thus gradually fit itself for a perfect life. Such a theory, however, is radically different from the ordinary doctrine of transmigration, inasmuch as it does not imply successive existences on earth.

**TRANSPLANTING**, the removal of a plant to a new situation. Most plants can be transplanted when very young, and from time to time till they are middle-aged, if due precautions are taken, and adequate mechanical means employed. In transplanting large trees a considerable amount of mechanical power is required to raise the tree and its roots together with the mass of earth adhering to them above the surface of the ground. Evelyn in his *Sylva* (1664) mentions several instances in which large trees were transplanted in considerable numbers in his day. In removing large trees two principles have been chiefly acted upon. According to one the stem of the tree, with a strong piece of timber braced to it, forms a lever; and on being drawn down over a fulcrum, consisting generally of an axle supported on wheels, the root with its ball of earth is raised up, and the tree is conveyed in an inclined position to its destination. By the other principle, which is that more recently adopted, the tree with its ball of earth is raised perpendicularly by screw power or otherwise, and this mode is unquestionably the best where there is clear space to move the tree along in an erect position, and even in some cases where the tree must necessarily be inclined after it is taken up on account of the want of headroom in its course of transit.

**TRANSPORTATION**, a punishment formerly in general practice in Britain for crimes of the more serious description, but falling short of the penalty of death. It varied in duration from seven years to the termination of the criminal's life, according to the

magnitude of the offence. Australia, Tasmania, and Norfolk Island were the stations to which convicts were conveyed. By an act of 1857 sentences of transportation were abolished, and superseded by sentences of penal servitude, varying from three years to the whole period of life. This act, however, reserved to the privy-council the right of ordering persons under sentence of penal servitude to be transported, and it was not till 1868 that transportation to Western Australia actually came to an end.

**TRANSUBSTANTIATION**. See **LORD'S SUPPER**.

**TRANSVAAL**, formerly **THE SOUTH AFRICAN REPUBLIC**, a British colony in South Africa, bounded on the north by Rhodesia, from which it is separated by the river Limpopo; on the east by Portuguese East Africa and Zululand; on the south by Natal and the Orange River Colony, the boundary being chiefly the Vaal river; and on the west by Bechuanaland; area, including Swaziland, about 122,150 square miles. A great part of the country consists of elevated plains or undulating plateaux, rising in the south and east to a height of from 4000 to 7000 feet above sea-level; in the north, or low country, where it slopes to the Limpopo, having an elevation of 1500 to 4000. The scenery is, as a rule, monotonous and uninteresting, though in parts relieved by ranges of wild and rugged mountains; but forest landscape is rare, and many parts are scantily supplied with water. In the east the great Drakenberg range is continued northward into the country, and the culminating point seems to be Mauch Peak, 8730 feet. In the south the now famous Witwatersrand range stretches from east to west, forming the watershed between the Vaal and the Limpopo basins. Here also is the Magaliesberg range. The rivers that intersect the country are chiefly tributaries of the Limpopo, such as the Crocodile, Magaliqueen, and Olifant. The climate naturally varies according to elevation and local circumstances; generally it is healthy, and even bracing, on the higher grounds; in the low grounds and river valleys it is tropical, and in the rainy season fever is apt to prevail, especially to the north of the watershed. The summer lasts from September to the end of March; the winter, from April to the end of August. This is the driest season. The rainiest months are December, January, and February. The indigenous flora is comparatively poor, but all kinds of European grains, fruits, and vegetables thrive excellently, and sub-tropical and tropical plants may be successfully cultivated in many localities, including oranges, cotton, sugar, coffee, and tobacco. The country formerly swarmed with large animals, but these have been exterminated or largely reduced in numbers. The country is more pastoral than agricultural, and the Boers, who are the chief owners of the land, possess large flocks and herds of sheep and cattle. Cultivation is extending, however, but in many parts to carry it to perfection irrigation would be necessary. The great product of the country at present is gold, the first field to be successfully worked being that of Lydenburg, opened in 1869. Mining progressed slowly, however, till 1886, when the Sheba Reef was discovered, and the Rand was proclaimed a gold-field. Since then the quantity obtained has enormously increased, the Witwatersrand having yielded no less than 4,288,086 ozs. in 1898, the total value of the yield for that year being over £15,000,000. The total output of all the Transvaal mines from 1887 to 1899 was 22,788,038 ozs. The same period also witnessed the rise and growth of the mining centre Johannesburg, from 'a few straggling shanties' to a town of 220,000 inhabitants in 1899. The Transvaal is rich also in other minerals, including coal, which is now



worked at several places. Silver is mined near Pretoria. Iron, zinc, antimony, quicksilver, copper, lead, and sulphur have also been reported. The total population in 1898 was given as 1,043,075, of whom 754,325 were coloured and 288,750 white. About 73 per cent of the whites were said to be of foreign origin, the remainder being the South African Dutch people, known as Boers. Of the whites some 70,000 or 80,000 were resident in Johannesburg, and of these some 67 per cent were of British origin, other foreigners being mostly Germans, Americans, and Portuguese. The coloured population consists of Kaffirs, Bechuanas, &c. Under the Boer constitution of 1858 (the Grondwet), as subsequently revised, the legislative body consisted of two volksraads or houses. The first volksraad was composed of twenty-nine members elected by direct vote of the electors, and no one could sit in it unless he was at least thirty years of age, and had been for two years a qualified voter. The second volksraad also consisted of twenty-nine members directly elected. No bill passed by the second raad could become law without the approval of the first. Members of the first raad were elected by the first-class burghers, that is, all male whites born in the country or resident prior to 1876, or who fought in certain subsequent campaigns, and their children from the age of sixteen. The second raad was elected by, and from, the first and second-class burghers, the latter of whom included all naturalized alien males and their children from the age of sixteen. Aliens could become naturalized after two years' residence, and they could become first-class burghers by resolution of the first raad twelve years after naturalization. The fourteen years period for full burghership was not introduced until the great immigration of gold-seekers, especially into Johannesburg, had made the little republic alarmed for its safety and national existence. In 1876-81 one year qualified for the franchise. The executive was in the hands of a president (from 1882 Stephen John Paul Kruger, see in SUPP.), elected for five years by the first-class burghers. He was assisted by an elected executive council. The seat of government is Pretoria, and the other chief towns are Johannesburg, Heidelberg, Potchefstroom, Rustenburg, Klerksdorp, Pietersburg, Lydenburg, Barberton, and Boksburg. The main railway through the Orange River Colony crosses the Vaal and runs north to Johannesburg, Pretoria, and Pietersburg. There are also lines from Pretoria to Delagoa Bay, from Johannesburg to Klerksdorp, and from Johannesburg to Durban. The revenue in 1898 was £3,983,560, the expenditure £3,971,473; estimated revenue for 1902-03, £3,700,000. The imports for nine months in 1902 were £7,771,000.

The Transvaal first appears in South African history in 1838, when some of the Boers who had left Cape Colony at the time of the Great Trek crossed the Vaal in order to escape from the rule of Britain. With native assistance they soon drove the invading Matabele across the Limpopo, and they afterwards adopted a republican system of government. In 1852, by the Sand River Convention, Great Britain formally recognized their complete independence, but it was not till 1860 that the four republics of Potchefstroom, Lydenburg, Utrecht, and Zoutpansberg were welded together into a single republic. Three years later Pretoria became the capital. The republic had to face many difficulties, financial and other, and Sir Theophilus Shepstone, a British commissioner with authority from the Imperial government, thought that in 1877 its position justified annexation, for the sake of the people themselves, and this was accordingly declared on April

12 of that year. The executive and the president formally protested, and it soon became clear that a large majority of the inhabitants were opposed to annexation. Had the promise of legislative autonomy, however, been carried out without delay, all might have been well, but the Boers were led by repeated refusals to take up arms, and on Dec. 13, 1880, declared their independence. The Boers at once invested all the British garrisons and cut off their communications. Then followed in quick succession the British disasters at Bronkhorst Spruit, Laing's Nek (Jan. 28, 1881), Ingogo (Feb. 7), and especially Majuba Hill (Feb. 27). These reverses, together with information concerning the possible effect of the continuation of the struggle upon the other Dutch inhabitants of South Africa, led the British government to conclude peace upon the basis of a modified Transvaal independence under British suzerainty. This settlement was embodied in the Pretoria Convention of 1881, but in 1884 this convention was superseded by the London Convention, under which the republic, thenceforward to be called the South African Republic, was granted internal independence, with the reservation of British control over foreign treaties. Trouble arose soon after in connection with the annexation by the Transvaal of territory in Bechuanaland outside of the limits assigned by the London Convention, but the affair was settled amicably. In 1886 the gold-fields of the Witwatersrand began to attract great numbers of British and others, and these steadily increased from year to year. The difficult questions connected with the naturalization of the Uitlanders (Outlanders), as the new-comers were called, and the granting to them of the franchise, had to be faced by the republic, which tried to put off the settlement as long as possible. The agitation among the Johannesburg Uitlanders reached a crisis in December, 1895, when a rising was arranged to take place, supported by an armed invasion from the west under Dr. L. S. Jameson, Administrator of Rhodesia. Jameson crossed the frontier on Dec. 29, but owing to some misunderstanding the revolt did not take place, and the 'raiders' were forced to surrender to a Boer force near Krugersdorp on Jan. 2, 1896. The Uitlanders gave up their arms, and the leaders of the internal agitation were tried. Four pleaded guilty to a charge of high treason, and the rest to *lèse-majesté*, but all were eventually released on the payment of various fines and the making of certain declarations. Jameson and his subordinates were handed over to the British government for trial. From that time events steadily drifted towards the disastrous war which began on October 11, 1899, and in which the South African Republic was joined by the Orange Free State. The story of the war is told in a separate article, SOUTH AFRICAN WAR (in SUPP.), and the terms on which the Boers agreed to surrender are also stated there. The Transvaal is now directly under a lieutenant-governor and executive council; the resettlement of the country is rapidly proceeding; trade and mining are rapidly expanding; and education, railway communication, &c., are now receiving much attention.

TRANSYLVANIA (German *Siebenbürgen*; Hungarian *Erdély*), the south-east portion of the Austrian Empire, now fully incorporated with Hungary; area, 21,500 square miles. The surface is mountainous, being covered by the Carpathian chain and its ramifications. The whole belongs to the basin of the Danube, which receives a great part of its waters very circuitously by means of the Maros and the Szamos, both tributaries of the Theiss. The climate is healthy; the summer heat of the lower grounds is at times extreme. There are magnificent

and valuable forests; fruits abound everywhere, and the culture of the vine is general. The crops include, besides the ordinary cereals, potatoes, &c., also maize, hemp, flax, and tobacco. Fine breeds of horses, cattle, and sheep are reared. Many horses are exported. Large numbers of swine are fattened. The wild animals include bears, wolves, and wild boars. The minerals are important, and include gold, silver, copper, lead, iron, quicksilver, antimony, coal, and salt. The last occupies immense tracts. Manufactures have made little progress, and are chiefly in the hands of Germans. The trade is chiefly confined to the natural produce of the country, and imported manufactures. The chief centres are Hermannstadt, Kronstadt, and Klausenburg. Education is in a somewhat backward state. The population, about 2,500,000, is very mixed. The principal nationalities are Roumanians, Magyars, and Germans, besides Gypsies, Jews, Bulgarians, and others. The chief religious bodies are Roman Catholics, Greek Catholics, and Protestants. The name Transylvania, signifying 'beyond the woods', is due to the extensive forests on the western side. In ancient times Transylvania was a part of the province of Dacia. From the fourth century onwards it was occupied by various nations in succession. In 1004 it was conquered by Stephen I. of Hungary, and was afterwards governed by a viceroy (*voyvode*). In the sixteenth century the voyvode John Zapolya obtained Transylvania as a sovereign principality, but it could not maintain its independence against the house of Austria, and in 1713 was united to Hungary. In 1765 Maria Theresa raised it to the rank of a grand-principality. It suffered severely during the commotions of 1848-49, and since 1867-68 it has been reunited to Hungary.

TRAP, a term rather loosely applied to igneous rocks, distinct from granite on the one hand and recent volcanic rocks (lavas, &c.) on the other, but not now used in any scientific sense. Such rocks often produce very picturesque or striking scenery. Basalt is the most compact, the hardest, and the heaviest of the trap-rocks; it almost always contains felspar, olivine, and augite, with a considerable portion of iron. The most remarkable form assumed by basalt is that of regular pillars, often grouped together in colonnades. To the effect of cooling are ascribed the prismatic shape of basaltic columns, and the ball-and-socket adaptation of the joints in these columns. The sea-cliffs of Mull, Skye, and other islands of the Hebrides often exhibit basalt in the columnar form. Of these, Staffa affords the most celebrated example. (See STAFFA.) The north coast of Antrim also exhibits an extensive development of basaltic columnar rocks, as at Fair Head and the Giant's Causeway. (See GIANT'S CAUSEWAY.) In the Isle of Skye there are pillars 400 feet in height.

TRAPANI (ancient *Drepanon* or *Drepanum*), a seaport in the west of Sicily, on a peninsula shaped like a sickle, and hence its name, from the Greek *drepanē*, a sickle. It is surrounded by walls flanked with bastions. The only important ecclesiastical edifice is the cathedral. The palace in which the provincial assemblies meet is a handsome edifice. There is a lyceum, and a statue of Victor Emmanuel stands in the piazza named from him. There are manufactures of articles in coral, shell, and alabaster. The harbour is good, and the trade is considerable in salt, wine, and flour. Fishing is actively carried on. At a short distance S.W. of the town is Mount San Giuliano, the ancient Eryx. (See ERYX.) Pop. 35,000.

TRAP-DOOR SPIDER. See MASON-SPIDER.

TRAPEZIUM, a quadrilateral figure of unequal sides, and consequently unequal angles, but with two of the sides parallel. A *trapezoid* is a quadri-

lateral figure with no two sides parallel; but sometimes the respective meanings are interchanged.

TRAPPE, LA, TRAPPISTS. See LA TRAPPE.

TRASIMENUS, LAOUS. See PERUGIA (LAGO DI).

TRAVANCOR, or TRAVANCORE, a native Indian state, under Madras, occupying the extreme south-west of the peninsula, its frontier terminating in the south-east at Cape Comorin; area, 6730 square miles. It is bounded by the Ghauts on the east, and most part of the territory is hilly, descending abruptly toward the sea, where the surface is flat and presents extensive back-waters. Streams are numerous, as are also canals and tanks for artificial irrigation in the south. The climate is generally considered healthy, and the soil fertile. Rice, pepper, cardamoms, cocoa and areca nuts, and oil-plants are the chief vegetable products. The mulberry, coffee, and tobacco thrive well. The dwellings are better than in many parts of India, and the middle classes of the population are usually able to read and write. The ruling family is Hindu; the sovereignty and inheritance of property pass in the female line, as elsewhere on the Malabar coast. Travancor, the former capital, is small, and now in decay. Trivandrum is the residence of the rajah. Pop. of state in 1891, 2,557,840 (including 500,000 Christians).

TRAVELLERS. See INN AND INNKEEPERS, and PASSENGERS.

TRAVELLER'S TREE (*Ravenna Madagascariensis*), an arborescent plant of the natural order Musaceæ (banana family). Its trunk terminates in a bundle of leaves arranged in the manner of a fan, each of which is borne by a petiole often 10 feet in length, and has a blade about 6 feet long and 2½ to 3 feet broad. The plant grows in marshy districts of Madagascar and Réunion. The seeds yield a flour, which is eaten by the natives. It is called Traveller's Tree from the fact that when an incision is made in the base of the petiole a quantity of limpid and wholesome water flows out, which renders it often a great resource for travellers. Another species, *R. guyanensis*, is found in Guiana and northern Brazil.

TRAVERTINE, a kind of limestone, abundant in different parts of Italy, and employed in ancient and modern buildings. See TUFA.

TRAVESTY, a comic treatment, particularly in poetry, of a subject which has been already handled gravely, so that it is, as it were, divested of its grave dress and a comic one put on.

TRAWLING, a mode of fishing in which a net in the form of a large bag 70 to 100 feet long, narrowing to the closed end, is dragged along the bottom of the sea. The mouth or wide end of the net in the 'beam trawl' is kept open by a beam, at the ends of which are attached the ends of the rope by which the net is dragged along. In the 'otter trawl', which has largely superseded the beam trawl, there is no beam, and the mouth is kept open chiefly by two boards that rest edgewise on the bottom, and are spread out diagonally by wire ropes attached to them and connected with the trawling vessel. In the narrow closed end of the net the fish are collected, and lest they should escape there is usually an inside net opening backwards. This mode of fishing is practised to a very great extent in the seas round the British Islands, especially in the North Sea, for nearly all kinds of fish except herring and mackerel. Cod, whiting, and other white fish are taken in this way in large numbers, and some kinds of flat-fish, as soles, can scarcely be taken in any other manner. There are now many small steam-vessels engaged in this industry, which has largely developed in recent years. It is often objected to as destroying fish spawn, and ultimately tending to injure the productiveness of the

fishing-grounds, but except, perhaps, as regards certain localities, this does not seem to be conclusively proved. Latterly, however, it has been prohibited within 3 miles of the British shores.

**TREACLE.** See **SUGAR.**

**TREAD-MILL,** an instrument of punishment of modern date, consisting of a large wheel, about 20 or 25 feet wide, with steps on its external surface, upon which the criminals are placed. Their weight sets the wheel in motion, and they maintain themselves in an upright posture by means of a horizontal bar fixed above them, of which they keep hold. The power thus obtained may be applied to the same purpose as water power, steam, &c. The tread-mill has recently been abandoned in most penitentiaries. It is the invention of Sir William Cubit of Ipswich, and was introduced into the prisons of Great Britain about 1820. See **PRISON DISCIPLINE.**

**TREASON, HIGH.** Treason, the *crimen læsæ majestatis* of the Roman law, is that crime which is directly committed against the supreme authority of the state, and is considered to be the greatest crime that can possibly be committed. The crime of taking the life of any person to whom the criminal owes duty or allegiance, as that of a lord or master, an ecclesiastical superior, a husband, was formerly held to be petty treason, and it was in opposition to this offence that treason against the sovereign or the state was called high treason; but by 9 George IV. cap. xxxi. s. 2 such taking of life is declared to be murder only, and high treason is therefore now the only treason. In a monarchy it is considered to be the betraying or the forfeiting of allegiance to the monarch; but in a community not governed by a supreme hereditary chief it has reference to the government or the whole body of the community. This crime can be committed only by a subject of the sovereign power or a citizen of the state to which he owes allegiance, and only against such sovereign or state; and it consists essentially in renouncing his allegiance and putting himself in the attitude of enmity or hostility. A traitor puts himself in the same relation to his own sovereign or state that a pirate holds to all states and governments. The present law of treason in the United Kingdom rests substantially upon the statute of the twenty-fifth year of Edward III., which comprehends the following descriptions, namely: 1, compassing or imagining the king's death; 2, violation of the king's companion (meaning the queen), his eldest daughter, unmarried, or the wife of his eldest son and heir; 3, levying war against the king in his realm; 4, adhering to his enemies in his realm, and giving them aid and comfort in the realm or elsewhere; 5, counterfeiting the great or privy seal; and 6, slaying the chancellor, treasurer, either of the justices of the Court of King's Bench or Common Pleas, or of the justices in eyre or of assize when in the discharge of their judicial functions in open court. The third of the offences detailed in this statute of Edward III.'s reign is no longer declared to be treason, but treason-felony, and has a milder punishment than treason annexed to it. (See the next article.) The clause of that statute pronouncing the counterfeiting of the great seal to be treason is now repealed. The English law condemns the person convicted of treason to be drawn in a hurdle to the place of execution, there to be hanged, then to have his head severed from his body, and his body divided into four quarters, the head and quarters being placed at the disposal of the crown. But the more barbarous and revolting parts of this punishment are usually remitted. Formerly also a conviction of treason worked forfeiture of lands and goods to the crown and attainder of blood, so that no person could inherit an estate to which he must have

derived a title through the person convicted of this crime. This attainder might be reversed, that is, the punishment of the traitor's heirs for his offence might be remitted by act of Parliament, as was done in respect to the heirs of Algernon Sydney. These provisions are now, however, abolished by 33 and 34 Vict. cap. xxiii. The concealment of treason is called misprision of treason. See **MISPRISON.**

**TREASON-FELONY,** a term commonly used to designate those offences which are pronounced felony by 11 and 12 Vict. cap. xii., namely, the compassing, imagining, inventing, devising, or intending, first, to deprive the sovereign of any of the royal powers or prerogatives; or, second, to levy war within the United Kingdom against the sovereign in order to force a change of measures or councils, or to put any force or restraint upon or intimidate either house of Parliament; or, third, to incite foreigners to invade any of the dominions of the crown, when such compassing, imagining, inventing, devising, or intending is declared or uttered by publication of any printing or writing, by any open and advised speaking, or by any overt act or deed. Any person found guilty of any of these species of felony is now liable at discretion to be sentenced to penal servitude for life or for a term not less than seven years, or to be imprisoned for a term not exceeding two years with or without hard labour.

**TREASURER, LORD HIGH,** the title given in England to a great officer of the crown first appointed by William I. He was intrusted with the management of the king's exchequer. In 1612 the duties of the office were for the first time distributed among commissioners, and since 1715 this has been the regular practice. (See **TREASURY.**) After the Union of England with Scotland in 1707 the Lord High-treasurer of England became Lord High-treasurer of Great Britain, and the corresponding office in Scotland ceased to exist. In 1816, by 56 Geo. III. cap. xcvi., although the title of lord high-treasurer was no longer in actual use, it was enacted that the title and the duties connected with it should thenceforth be held as for the United Kingdom.

**TREASURE TROVE,** coin, gold or silver plate, or bullion found hidden in the earth or other private place. Such treasure belongs to the crown, and any person finding it is bound to give information of the fact to the officers of the crown. Failing to do so he is liable to fine or imprisonment. The crown, on having treasure trove delivered up to it, is in the habit of paying to the finder its full value, in order that persons may not be induced to conceal such discoveries with a view to the profit, whereby many interesting remains of antiquity might be lost.

**TREASURY,** the department of government to which is intrusted the management of the civil list and of the revenues of the kingdom generally. Formerly this department was under the management of a lord high-treasurer appointed by the sovereign; it is now intrusted to a board of commissioners, the two heads of which are the first lord of the treasury and the chancellor of the exchequer. According to modern usage the first lord of the treasury, who may be a member either of the House of Lords or the House of Commons, is the head of the government; although, therefore, he is responsible for the treasury as well as for other departments his superintendence is general, and the special head of the department is the chancellor of the exchequer. There are two joint-secretaries to the treasury, one of whom, called the patronage secretary, exercises functions which are no longer connected with revenue, although their original connection with it is sufficiently obvious. The lord high-treasurer, or the treasury board, had the control of all appointments relating to the

revenue, and the same official who distributed these appointments was intrusted with the delicate task of securing the allegiance of the government supporters and communicating instructions to them on important occasions where their aid was needed. This is now the sole function of the patronage secretary, who is popularly called the ministerial whip. The treasury board has the control of the various permanent offices connected with the revenue. It is seldom attended either by the chancellor of the exchequer or by the prime minister.

**TREATY**, an agreement, league, or contract between two or more nations or sovereigns formally signed by commissioners properly authorized, and ratified by the several sovereigns or the supreme power of each state. Treaties are of various kinds, as treaties for regulating commercial intercourse, treaties of alliance, offensive and defensive, treaties of peace, &c. In most monarchies the power of making and ratifying treaties is vested in the sovereign; in republics it is vested in the chief magistrate, senate, or executive council; in the United States of America it is vested in the president by and with the consent of the senate. Treaties may be concluded and signed by diplomatic agents, but these, of course, must be furnished with full powers by the sovereign authority of their states.

**TREBIZOND** (Turkish, *Tarabosan*; anciently *Trapezûs*), a town and seaport of Asiatic Turkey, capital of a vilayet of the same name, on the shore of the Black Sea, at the mouth of the Muchka, 120 miles N.W. of Erzeroum. Its houses are mostly of wood, and its chief buildings are the citadel, mosques (formerly Greek churches), and churches. The streets are narrow, crooked, and badly paved. It is the see of a Greek metropolitan, an Armenian archbishop, and a United Armenian bishop. It has no proper harbour, but carries on a considerable trade. The exports, chiefly tobacco, hazel-nuts, carpets, cattle, silks, and raisins, amounted to £691,970 in 1901, and the imports, mainly cottons, woollens, sugar, and silks, to £1,669,090. Pop. 35,000.

**TREDEGAR**, a market-town of England, in the county of Monmouth, 12 miles west by south of Abergavenny, on the Sirhowy. It has a handsome town-hall and market-house, three established churches, and a number of other places of worship; and a fine public park. Near it are valuable mines of coal and ironstone, which furnish employment to many persons. Pop. (1891), 17,341; (1901), 18,574.

**TREE**, a perennial plant with a single wooded stem, from which spring the branches containing the various conservative and reproductive organs, leaves, blossoms, and fruit. The form most nearly resembling a tree is the shrub, in which the branches spring directly from the crown of the root without a stem. The two forms are not absolutely distinguished, many species of plants being capable of either development, according to cultivation or other circumstances. Trees are both endogenous and exogenous; by far the greater number both of individuals and of varieties belong to the latter class. Trees are an important feature in the landscapes of wooded countries, to which they add an element of incomparable beauty, and they exercise a very powerful climatic influence. Their utility in many ways is great. They supply wood and bear fruits of various kinds with an inexhaustible range of valuable qualities. The roots, bark, and other portions of trees are all utilized in an endless variety of ways. Trees of which the whole foliage falls off periodically, leaving them bare in winter, are called deciduous; those of which the foliage falls only partially, a fresh crop of leaves being always supplied before the mature leaves are exhausted, are called evergreen.

Trees attain a great and indefinite age. They are the longest-lived organisms of the vegetable kingdom, and greatly exceed the age of animals. According to some theorists a tree is not an individual organism, but a hereditary series of distinct plants growing upon the decayed forms of their predecessors. There is consequently no limit, such as that imposed by individual decay in animal organisms, to the age they may attain. See **ARBORICULTURE**, **BOTANY**, **TIMBER**, &c.

**TREE-FERNS**. See **FERNS**.

**TREE-KANGAROOS**. See **KANGAROOS**.

**TREE-NAILS**, certain long, cylindrical wooden pins employed to connect the planks of the ship's side and bottom to the corresponding timbers.

**TREFOIL**, a distinctive title applied to plants of various kinds on account of a peculiarity of the form of the leaf, which consists of three leaflets; examples, buckbean, clover, and medick. See the articles on these plants.

**TREMATODA**, a division of *Scolecida*, belonging to the group of *Platyelmia* or Flat-worms, and represented by such forms as the Flukes or *Distomes* (see **LIVER-FLUKE**) and their allies. These animals are known by their flattened shape, and by the presence of one or more suckers for adhesion to the tissues of their hosts. A digestive system is very generally present. The Trematoda are all hermaphrodite—that is, possess the sexes united in the same individual. In their development the Trematoda may exhibit a complicated metamorphosis. The young or larvæ are distinguished from those of the *Teniada* or Tape-worms (which see), in that they do not possess hooks developed at the cephalic or head extremity; and they are never, as in Tape-worms, inclosed within cysts. See **PARASITES**, **PLATYHELMINTHES**, **ROT**, *Scolecida*, &c.

**TREMOLITE**. See **HORNBLende**.

**TRENCHES**, the name given in general to all those works which are used in attacking a fortress. See **SIEGE**.

**TRENT**, a river of England which rises in Staffordshire, 4 miles north of Burslem; flows first south-east till it reaches the south-east frontiers of Stafford, when it turns suddenly north-east, proceeds across the south corner of Derbyshire, then N.N.E. past the town and through the county of Nottingham, then almost due north, forming part of the boundary between that county and Lincoln, enters the latter county, and falls into the Humber at Trent Falls after a course of 144 miles, of which 117 miles, reaching as far as Burton-on-Trent, are navigable by barges, and 25 miles, as far as Gainsborough, by vessels of 200 tons. Its chief affluents are, on the right, the Sow, Tame, Soar, and Devon; and on the left, the Blyth, Dove, and Derwent. Its navigable importance is much increased by a series of canals. Its basin has an area of about 4000 square miles.

**TRENT** (German, *Trient*), a fortified town of Austria, in Tyrol, giving name to, but administratively distinct from, a circle, beautifully situated in a large valley surrounded by hills, on the left bank of the Etsch or Adige, which is here navigable and crossed by a wooden bridge, 75 miles north-west of Venice. Its church-towers, palaces, and ruined castle give it, when seen from a distance, a very imposing appearance. The houses are in the Italian style, and the streets wide and commodious. The town contains a ruined Gothic castle of vast extent and picturesque appearance; a cathedral, a noble structure entirely of marble, finished in 1212, in the Byzantine style; three other churches, one of which, Santa Maria Maggiore, a modernized building of red marble, is historically interesting as the place where the celebrated Council of Trent held its sittings. Silk-mills

and distilleries are the principal manufacturing establishments. An active trade is carried on, particularly in silk, wine, and brandy. Trent is a place of great antiquity, having been a *thropic* before 380. In the middle ages its bishops made themselves independent, and sat in the Germanic diet as princes of the empire. The only memorable event in its history is the council—assembled A.D. 1545, concluded A.D. 1563—which was held in it, and bears its name. Pop. (1890), 21,571; (1900), 24,908.

**TRENT, COUNCIL OF**, a celebrated oecumenical council of the Roman Catholic Church, convened to settle various controversies that were agitating the church during the Reformation period, and for the reform of abuses. It met during the pontificate of Paul III. at Trent in 1545, and comprised four legates, eleven cardinals, twenty-five archbishops, thirty-nine procurators of absent bishops, and seven generals of religious orders. The wars in Germany caused its transference to Bologna in 1546, and its sittings were for a time suspended. Pope Julius III. having reassembled it at Trent in 1551 it dispersed the year following on the approach of the Lutherans under Maurice of Saxony. After eight years of interruption it was again called together by Pius IV., after which it was able to finish its labours in 1563. This council definitively settled the doctrines of the Roman Catholic Church. Its decrees are embodied in what is known as the Creed of Pius IV., which we have already given in our article **ROMAN CATHOLIC CHURCH**. The council also published some reformatory decrees, instituting seminaries and causing a catechism to be drawn up. All the decrees of the council as to dogma were unanimously accepted by the Catholic States, but those relating to discipline were partially rejected, especially in France, as contrary to the usages and infringing on the liberties of the Gallican Church. The council issued its canons and decrees in Latin, and they have been often translated; the best English translation is that of the Rev. Jeremiah O'Donovan. The history of the council has been written by Sarpi and Pallavicino. See **PALLAVICINO**.

**TRENTON**, a city of the United States, capital of New Jersey, on the left bank of the Delaware, opposite the Lower Falls, 50 miles south-west of New York. It is laid out with great regularity, and has a state-house finely situated on a commanding height, a courthouse, governor's house, and state-prison, covering an area of 4 acres. It is at the head of the navigation of the river and has abundant water-power. Pottery is the chief manufacture, and the trade is extensive. Pop. (1900), 78,307.

**TREPANG**. See **HOLOTHURIA**.

**TREPANNING**, the operation of opening the skull by means of a surgical instrument adapted for the purpose. The instrument used is called a *trepan* or *trepine*, and consists of a handle, to which is fixed a circular saw or hollow iron cylinder, of about 1 inch in diameter, called the *crown*, from the centre of which projects a sharp perforator called the *centre-pin*. The upper part of the centre-pin screws into a hole at the top of the crown; its use is to steady the trepan before the teeth of the saw have made a sufficient furrow to prevent it from slipping; for which purpose it is pushed down below the level of the teeth of the saw, and fixed in the centre of the bone to be removed. The trephine differs from the trepan in having its crown fixed upon and worked by a common transverse handle, like a gimlet, instead of being turned by a handle, like a wimble or centre-bit, as is the case with the trepan. The former is used in England; the latter is preferred by the surgeons of continental Europe. The operation of trepanning is resorted to for the purpose of relieving the brain

from pressure. Such pressure may be caused by the depression of a portion of the cranium, or it may be produced by an extravasation of blood, or by the lodgment of matter betwixt the skull and the *dura mater*, occasioned by a blow upon the head, or the inflammation of the membranes of the brain. The trepan is also used when abscesses exist in bones, such as the upper end of the tibia.

**TRESPASS**, in English law, a term applied generally to any offence against the person or property of another, but more especially applied to a peaceable but unlawful entry upon the property of another, the remedy for which is by an action of damages. Any person who enters the house or grounds of another without leave may be expelled by force if he does not leave when requested to do so. Trespass is justifiable when the intrusion upon another's property is for a lawful purpose, as to pay or demand money lawfully due, or to execute lawfully any legal process. Entrance upon an inn or public-house without leave of the owner constitutes a justifiable trespass. The abuse of any such lawful right of entry by misconduct brings the person who abuses it within the law of trespass. Entrance upon the house or property of another cannot be insisted upon even for a lawful purpose against the will of the owner. A creditor or customer can be ordered away by a shopkeeper or householder, and even the civil courts have no power to give a right of entry to officers intrusted with the execution of legal processes, but such officers may maintain possession if once they gain entrance. To pursue game over the ground of another without a grant of free warren is a trespass at common law. In order to prevent trifling actions for trespass the law is that no costs shall be given to a plaintiff to whom a jury awards less than £5 damages, unless the action is brought to try a right, or the trespass is wilful and malicious. A trespass is deemed wilful where the trespasser has received notice not to intrude, and malicious where the intrusion is designed for the purpose of injury or annoyance. Where these circumstances are proved, which the judge is bound to certify, full costs are recoverable, whatever may be the amount of damage. Trespassers in pursuit of game are liable to summary prosecution under the game-laws. (See **GAME-LAWS**.) The Scotch law of trespass is similar to the English. Justices of the peace have in Scotland a summary jurisdiction against trespassers, and an interdict may be obtained from court to prevent a threatened trespass.

**TREVES** (German, *Trier*), a town of Prussia, capital of the province of Rheinland, in a fertile valley on the right bank of the Moselle, here crossed by a bridge, which is partly of Roman construction. Treves is considered the oldest city in Germany, and is by far the richest of its cities in Roman remains. It is on the whole but indifferently built. The chief buildings are the cathedral (restored since 1897), an irregular structure in the earliest Romanesque style, containing the celebrated Holy Coat (see **HOLY COAT OF TREVES**), the Liebfrauenkirche or Church of Our Lady, a circular edifice adjoining the cathedral, and one of the earliest and most elegant specimens of pure pointed Gothic; the Church of St. Gangolph; the Basilica, a Roman building, now converted into a Protestant church; the palace of the electors and bishops, now converted into a barrack; the Schwarzes-Thor or Porta Nigra (Black Gate), one of the most interesting monuments of the town, a magnificent Roman three-storied gateway, believed to belong to the first century of our era, decorated in front with rows of Tuscan columns, and presenting the massive simplicity of Roman structure; the so-called Roman Baths, a picturesque group of ruins; the Roman

baths proper, belonging to the third or fourth century; and the Roman amphitheatre, outside the town. There is a public library of some 100,000 volumes, and a provincial museum containing Roman and other antiquities. The manufactures include iron, dyes, furniture, hats, leather, tobacco, &c. Treves, when Julius Cæsar led his armies into the district, was the capital of a powerful people, whom he calls the Treviri. It afterwards, under Augustus, was made a Roman colony under the name of Augusta Trevirorum, and became the capital of Gallia Belgica. Several of the Roman emperors often resided in it, and it attained to great magnificence. During the invasion of the Goths, Huns, and Vandals it was almost annihilated, but revived and rose to great splendour under the archbishop-electors, who possessed extensive domains, often maintained large armies, and managed, by their union of temporal and ecclesiastical sovereignty, to exercise great political influence in Germany. Pop. (1900), 43,324.

**TREVISO**, a town of Italy, capital of the province of Treviso, 15 miles N.W. of Venice, on the Sile. Its chief buildings are the cathedral (unfinished), the church of S. Nicolò, the town-hall, theatre, and provincial palace (restored); and there is a monument commemorating the liberation of Italy and one to Victor Emmanuel. The manufactures include metal goods, machines, paper, silks, pottery, &c.; and the trade is in corn, cattle, and fruit. Pop. in 1901, 34,004.

**TRIAL**. See JURY and PROCEDURE (CIVIL).

**TRIANGLE**, a plane figure bounded by three right lines; a portion of a spherical surface cut out by three planes which meet at the centre of the sphere. It is found convenient to restrict the name spherical triangle to figures whose sides are each less than a semicircle of the sphere. See TRIGONOMETRY.

**TRIANGULAR NUMBERS**. See FIGURAL NUMBERS.

**TRIANGULATION**. See ORDINANCE SURVEY.

**TRIAS**. See GEOLOGY.

**TRIBUNE** (*tribunus*). See ROME—History.

**TRICHINA**. See NEMATHELMIA.

**TRICHINAPALLI**, or **TRICHINOPOLY**, a town of British India, capital of district of same name, in the Presidency of Madras, on the right bank of the Cavery. It is a station for British and native forces, and there is here a fort or citadel situated on a granite peak 500 feet in height, which commands all the surrounding country. On the rock are also a large and massive pagoda, and a square-pillared Hindu edifice; and in its southern face is a sculptured cave-temple. At the foot of the rock is the closely-built native town, and beyond it, on the south and west, are the various barracks, several hospitals, handsome residences for military officers, parade-ground, a race-course, public rooms, St. John's church, with the tomb of Bishop Heber, a Roman Catholic chapel, &c. Trichinapalli chains and jewelry are famous; there are manufactures of cottons, linens, &c. Pop. (1891), 90,730; (1901), 104,690.—The district is bounded north by Salem and South Arcot, west by Salem and Coimbatore, south by Madurai and Pudukottai state, and east by Tanjore; area, 3561 square miles. Pop. (1891), 1,215,033.

**TRICOLOUR**, any national flag with three colours in nearly equal masses, especially the flag, called *tricolore*, adopted by the French during the revolutionary period. The French tricolour has blue, white, and red in vertical bands from the staff outwards. For the tricolours of Italy, Roumania, Mexico, and other countries, see the plate **FLAGS**.

**TRIDENT**. See NEPTUNE.

**TRIENNIAL ACT**, the name generally given to the Act of Parliament 16 Charles II., 'for the assembling and holding of Parliaments once in three

years at least'. This act was confirmed, after the Revolution of 1688, by 6 William and Mary, cap. ii. The Septennial Act 1 George I. cap. xxxviii., passed 7th May, 1716, empowered Parliaments to sit for seven years.

**TRIEST** (Italian, *Trieste*), a seaport town of Austria, in the Küstenland, 214 miles south-west of Vienna, on a gulf of same name at the north-eastern extremity of the Adriatic. It stands partly on sloping and partly on level ground, in the form of a semicircle inclosed by hills. The old town, on a slope surmounted by the castle, is surrounded by old black walls, and has steep, narrow, and crooked streets. The more modern parts of the town are regularly built of handsome white houses, either lining broad, commodious, well-paved streets, or forming spacious elegant squares. A broad canal, deep enough to float vessels of large burden, runs up from the harbour into the town, and enables the merchants to receive or deliver cargoes at their doors. The principal edifices are the Tergesteum or Rathaus, serving as an exchange; the old exchange, now the seat of the chamber of commerce; the palace of the Austrian Lloyd; the commercial and nautical academy, with a fine museum and an observatory; a museum of antiquities; a municipal museum; the new dicasterial building; and a cathedral of very great antiquity. Corn and timber form the chief articles of export, others being flour, oil cake and seeds, paper and rags, hemp, glass-ware, and valonia. The principal imports are colonial goods, coal and iron, cotton and cotton goods, dried fruits, hides, wines, &c. Triest is the head-quarters of the Austrian Lloyd's steam-packet company, which possesses a large fleet of steamers trading to Venice, Alexandria, Varna, Constantinople, &c. In 1901 the number of vessels entered in the home and foreign trade was 9970 of 2,278,801 tons; cleared, 10,042 of 2,291,964 tons. The chief share of the foreign trade belongs to Britain and Italy. The imports in 1901 amounted to £15,646,000; the exports to £13,000,000. The commerce of Trieste has lately suffered from the competition of Fiume. Though Triest is more a commercial than a manufacturing town, the manufactures are numerous and include white-lead, wax candles, soap, roseoglio, spirits, earthenware, and morocco leather. A great number of vessels also are built. Triest existed under the Romans (the Latin name being *Tergeste* or *Tergestum*), but never rose to much importance till about the middle of the eighteenth century. The country immediately around Triest is extremely beautiful—gardens, vineyards, and orchards meet the eye in every direction. The town itself is more Italian than German; accounts are generally kept and most of the business done in Italian; Italian papers and pamphlets fill the coffee-houses; the chief magistrate even is not *Bürgermeister* but *Podestà*. Pop. in 1890, 157,648; in 1900, 178,127.

**TRIFORIUM**, in architecture, a gallery or open space between the vaulting and the roof of the aisles of a church, generally lighted from the nave or by windows in the wall of the building.

**TRIGGER-FISHES** (*Balistes*), a genus of Teleostean Fishes, so named from the peculiar structure of the dorsal fin, the first ray or spine of which can only be depressed by the movement of the second ray—the mechanism being thus like that of a gun-trigger. *Balistes cuspidatum*, *B. vetula*, and *B. tomentosus* of tropical seas exemplify this group.

**TRIGLYPHS**. See ARCHITECTURE.

**TRIGONOMETRICAL SURVEY**. See ORDINANCE SURVEY.

**TRIGONOMETRY**, the science of the measurement of triangles; the science of angular measure-



**ment.** Angles are measured in degrees or radians. Two right lines being perpendicular to one another, and intersecting, if an arc be described between them from the point of intersection as centre, and this arc divided into ninety equal parts, each of them is called a degree, and a pair of lines drawn from each end of one such division will include an angle of one degree; degrees are again subdivided into minutes and seconds. A circle being described of any radius, and a portion of its circumference being taken equal to what a radius would lie along if it were bent to the shape of the circumference, two right lines joining the extremities of this portion to the centre include an angle called a *radian*, which is a definite angle, and may be used as a unit of angular measurement. A radian is equal to  $57.29577951..$  degrees. The number of radians in two right angles is  $3.14159..$  This number is always denoted by  $\pi$ . Trigonometry is divided into *plane* and *spherical*. (See TRIANGLE.) From a point in either of two right lines which contain an angle less than a right angle draw a perpendicular to the other line; then if A represent the intersection of the lines, P the point from which the perpendicular is drawn, and M the foot of the perpendicular,  $PM \div AP$  is called the sine of the angle A,  $AM \div AP$  is the cosine of A,  $PM \div AM$  is the tangent of A,  $AM \div PM$  is the cotangent of A,  $AP \div AM$  is the secant of A,  $AP \div PM$  is the cosecant of A, cosine of A subtracted from 1 is the versed sine of A, and sine A subtracted from 1 is the covered sine of A. The above are the trigonometrical functions of the angle. It is found easy to consider the trigonometrical functions of all angles, whether they are greater than a right angle or not, by paying attention to the directions in which it is agreed to consider measurements as positive or negative.

To solve a triangle, three independent things must be known, such as two angles and a side, two sides and an angle, or three sides. The three angles are not independent, because, if we are given two angles, the third is the difference between their sum and two right angles. Let the angles of a triangle be denoted by A, B, and C, and let the sides opposite these angles be denoted a, b, and c. Given A, and C, and b,  $a : b :: \sin A : \sin B$  and B is equal to  $180^\circ - (A + C)$ ; so we have  $a = \frac{b \sin A}{\sin B}$ ; similarly,  $c : b ::$

$\sin C : \sin B$  and  $c = \frac{b \sin C}{\sin B}$ . Given A, and c, and b,

$\tan \frac{B - C}{2} = \frac{b - c}{b + c} \cot \frac{A}{2}$ , from which B and C are found, and a may be found as before. Given A, and b, and a, then  $a : b :: \sin A : \sin B$ ;  $\therefore \sin B = \frac{b \sin A}{a}$ .

We here find sin B, and there are two angles which have the same sine as B, namely, B, and the angle called the supplement of B, that is  $180^\circ - B$ . This is called the *ambiguous case*. Given the three sides, let s denote half the sum of the three sides, then

$$\sin \frac{A}{2} = \sqrt{\frac{(s-b)(s-c)}{bc}}, \cos \frac{A}{2} = \sqrt{\frac{s(s-a)}{bc}},$$

$$\tan \frac{A}{2} = \sqrt{\frac{(s-b)(s-c)}{s(s-a)}}, \text{ and similar formulæ}$$

are true for the other half angles. Solutions of triangles are worked by means of tables of the values of the trigonometrical functions, and the processes are much facilitated by the use of logarithms. Books of tables contain, besides the numerical values for the sines and cosines of all angles differing by  $1'$  between  $0^\circ$  and  $90^\circ$ , the logarithmical values for their sines, cosines, tangents, cotangents, secants, and cosecants. It must be remembered that the logarithmic functions are

each increased by ten, so as to avoid negative characteristics, and to distinguish the tabular logarithm from the real logarithm it is denoted by the letter L; thus, in the case of given the three sides, we should work the question as follows—

$$\sin \frac{A}{2} = \sqrt{\frac{(s-b)(s-c)}{bc}},$$

$$\therefore L \sin \frac{A}{2} = \frac{\log(s-b) + \log(s-c) - \log b - \log c}{2} + 10.$$

For the extended applications of trigonometry, and to understand anything of spherical trigonometry, recourse must be had to special treatises on the subject.

**TRILL**, or **SHAKE** (in Italian *Trillo*), is, in music, the quick, uniform alternation of two adjoining tones or semitones. See MUSIC.

**TRILOBITE**, an extinct genus of remarkable Crustacean animals, so named from the general appearance of the body, being divided on its dorsal surface into three longitudinal lobes. The fossil remains of Trilobites occur from the Upper Cambrian to the Lower Carboniferous rocks, these forms being thus exclusively Palaeozoic in their geological distribution. The head was protected by a shield (cephalic shield) or buckler, of semi-circular shape, and consisting of a central piece (*glabella*) and two lateral portions. The glabella appears to have covered and protected the stomach-region in the living animal. This head-shield bore a pair of large compound eyes, which were sessile or unstalked; and it is rather a curious fact that no appendages of the nature of limbs or other structures (so plentifully developed in living Crustaceans) have been found associated with the Trilobites, with the exception of a small lip-plate bearing a palp or organ of touch. The absence of appendages is all the more to be wondered at, inasmuch as the bodies of the Trilobites are themselves very well preserved; and, presuming that, as in existing Crustaceans, the limbs, like the body, were invested with a hard limy shell or exoskeleton, it seems difficult to account for the non-preservation of the body-appendages. The segments which go to make up the thorax or chest-region were movable upon one another, and in all probability many Trilobites must have possessed the power of rolling themselves up for defence, like our existing Woodlice or Slaters (see ONISCUS). The segments of the abdomen or tail formed a *pygidium* or *caudal shield*, and were amalgamated or united to form a single piece or plate; and this latter shield may be provided with prominent spines or projections. With regard to the relationship of the Trilobites to living Crustaceans, the view which has received most support is that they are most nearly related to the Isopoda or Woodlice, and also to the Phyllopodous Crustaceans. (See PHYLLOPODA.) The most important genera of Trilobites are *Agnostus*, *Olenus*, *Paradoxides*, *Asaphus* (see Pl. II. fig. 2, at GEOLOGY) *Cheirurus*, *Calymene*, *Homalonotus*, *Phacops*, &c.

**TRILOGY**, among the ancient Greeks, a union of three tragedies, connected in subject, which, together with a satirical piece, were performed in immediate succession. There is only one trilogy of antiquity which we can be certain of possessing complete, namely, the Orestias of Æschylus, which contains the Agamemnon, Choëphori, and Eumenides.

**TRIMURTI** (from Sanskrit *tri*, three, and *murti*, form), the name of the Hindu trinity, Brahma, Vishnu, and Śiva, considered as an inseparable unity. The sectaries of Brahma, Vishnu, and Śiva respectively make their god the original unity from which the trinity emanates; but considered separately, Brahma is the creating, Vishnu the preserving, and Śiva the destroying principle of the deity, while Tri-



**trīrti** is the theological or philosophical unity, which combines these separate forms in one self-existent being. (See **BRAHMA**, **SIVA**, and **VISHNU**.) The **Trīmūrti** is represented symbolically as one body with three heads, **Vishnu** at the right, **Siva** at the left, and **Brahma** in the middle.

**TRINCOMALEE**, a maritime town of Ceylon, on the east coast, on the north side of the entrance to a noble harbour, at the foot of a height crowned by a fort. The fortifications for the defence of the harbour have recently been greatly strengthened and improved, heavy guns of the modern type being mounted in the forts and batteries. The town has rather a mean appearance. The harbour is the principal harbour of refuge for shipping in the Bay of Bengal and along the Coromandel coast during the north-eastern monsoon. The town successively belonged to the Portuguese and the Dutch, and was taken by the British from the latter in 1795. Pop. (1891), 11,411.

**TRING**, a market-town of England, in the county of Hertford, 31 miles north-west by west of London, a station on the London and North-Western Railway. It has a handsome church (restored); Victoria Hall; a literary and scientific institute; Rothschild museum; market-house, &c.; manufactures of canvas and straw-plait, and silk throwing and weaving, which are all, however, on the decline. Pop. (1881), 4354; (1891), 4525; (1901), 4368.

**TRINIDAD**, one of the British West India Islands, and, excepting Jamaica, the largest and most valuable. It is the most southerly of the Windward group, lies immediately off the north-east coast of Venezuela, at the mouth of the Gulf of Paria, opposite the northern mouths of the Orinoco; and is of an oblong form, with considerable projections at all its angles except the south-east; area, 1755 square miles. Approached from the north Trinidad appears like an immense ridge of rocks; its eastern and southern shores are also rocky and high; but on the west, or side next the Gulf of Paria, it presents one of the most beautiful and magnificent panoramas imaginable, hills, valleys, and plains being covered with a verdure that knows no decay. The mountain chains run west to east. In the north, near the sea, they attain an elevation of about 3000 feet, and are broken and rugged. In the centre of the island is a less elevated group of mountains, and in the south a series of beautiful hills and knolls, among which numerous delightful valleys occur. In the intervals between the ranges of mountains are several extensive plains, plentifully watered by numerous streams, but generally terminating towards the Gulf of Paria in great swamps. The principal rivers are the Caroni, the Oropuche, and the Ortoire; the first two navigable to a considerable distance inland by small craft. Near Point Hicacos, forming the south-western extremity of the island, are several mud-volcanoes. Submarine volcanoes also occur on both sides of the island. An asphaltic or pitch lake occurs on the leeward side of the island, on a small peninsula jutting into the sea a little to the north-east of Guapo Bay. It is about 1½ mile in circumference, and elevated 80 feet above the level of the sea. The pitch at the sides of the lake is perfectly hard and cold, but towards the middle the heat gradually increases, and at last the pitch boils up in a liquid state. The climate is less unhealthy than that of many of the other West India Islands, and it is not subject to droughts. The soil is in general extremely fertile, and the elevated parts of the surface are mostly covered with dense forests, which contain the finest wood for ship-building and for ornamental purposes, amongst which the red cedar and a great variety of palms are conspicuous. The chief crop of Trinidad is sugar; the other exportable products are

molasses, rum, cocoa, coffee, pitch, cocoa-nuts, oranges, balata gum, tobacco, bitters. The total value of the imports into Trinidad in 1900 was £2,500,258; that of the exports was £2,584,549. Trinidad is a crown colony, the public affairs being administered by a governor, assisted by an executive and a legislative council. It was discovered by Columbus in July, 1498, and was taken from the Spaniards by the British in 1797. The island of Tobago is part of the colony. Port of Spain, a fine seaport town on the north-west side of Trinidad, is the capital, and other boroughs are San Fernando (a seaport) and Arima. Education, both secondary and primary, is partly secular, partly denominational. There are 80 miles of railway. Pop. in 1891, 208,030; in 1901, 253,250, including English, French, Spaniards, Germans, and over 85,000 Indian coolies.

**TRINITY**, a theological name given to the Deity, as expressive of the Christian doctrine of the Triune nature of God. The doctrine of the Trinity is nowhere expressly taught in the Old Testament. The doctrine in regard to the divine nature which is most strongly insisted on throughout the Old Testament is the unity of God as opposed to polytheism, and by the names by which God revealed himself to Moses (Ex. iii. 14, 15, and other passages) it is implied that the divine nature is inscrutable to human intelligence. The plural form used to designate the Deity in the account of the creation, and many other incidental circumstances or expressions, are, however, held as implying, if not teaching, this doctrine.

In the New Testament it is evident that the doctrine of a Trinity in the divine nature is clearly and copiously taught. In the Gospels Christ himself asserts a mysterious union between himself and the Father, appropriates to himself by an evident allusion the mysterious name of God revealed to Moses, and repeatedly refers to the Holy Spirit along with the Father as partaking of the same divine nature and union. The same doctrine is implied in the teaching of John, the forerunner. In the baptism of Christ by him the Holy Spirit is represented as descending visibly upon him while he is recognized by an audible voice from the Father, and in the rite of baptism instituted by Christ the names of Father, Son, and Holy Ghost are used as the joint designation of the divine being. The apostles and other writers of the New Testament Epistles constantly employ this form both in the introductory assertion of their authority and in their closing benedictions, and in the Epistles of Paul distinct arguments are introduced to justify the attribution of divinity in union with humanity to Jesus Christ. It is thus evident that in the New Testament the accepted manifestation of God is a Trinity in unity.

Among the definitions which resulted from the conflict of opinion in the early church with regard to the doctrine of the Trinity, that which was adopted by the Catholic Church and is generally accepted by orthodox Christians, fairly claims the merit of the fullest harmony and most comprehensive consistency with the various statements of Scripture. It is that there are in the Godhead three persons, one in substance, co-eternal, equal in power, the Father, Son, and Holy Ghost. It was only, however, after a severe and protracted conflict that this definition came to be generally accepted, and as soon as the definition proceeds one step further a wide schism again separates the church. The Eastern Church holds that the Holy Ghost proceeds from the Father, the Western, throughout all its divisions, adopting the amended form of the Nicene Creed (see **NICE**, **COUNCILS OF**), holds that he proceeds from the Father and the Son. The three creeds commonly called the Apostles', the Athanasian, and the Nicene, all contain

the points of agreement between the two divisions of the church, while on the point of difference the Athanasian and the commonly known form of the Nicene express the faith of the Western Church. The word 'Trinity' is not in Scripture. The term persons is not applied in Scripture to the Trinity, but something analogous to the conception of personality seems to be implied in the apostolical arguments of the epistles. See **ARIANS** and **SABELLIUS**.

**TRINITY COLLEGE.** See **DUBLIN UNIVERSITY**.

**TRINITY COLLEGE**, Cambridge, was formed by Henry VIII. in 1546 by the extension and consolidation of several earlier foundations. It is the largest in the university, having nearly 700 undergraduates in residence. Of the long line of distinguished *alumni* may be mentioned Bacon, Barrow, Newton, Cowley, Dryden, Bentley, Porson, Byron, Macaulay, Hallam, and Tennyson. There is a college of the same name at Oxford, and also one called Trinity Hall at Cambridge.

**TRINITY HOUSE**, London, a society incorporated in 1514 by Henry VIII. for the promotion of commerce and navigation, by licensing and regulating pilots, and erecting and ordering lighthouses, beacons, buoys, &c. The corporation is now empowered to appoint and license pilots for the English coasts, and has a general supervision over the corporations which have charge of the lighthouses and buoys of Scotland and Ireland, subject to an appeal to the Board of Trade, to whose general superintendence the Trinity House is also subject in matters relating to England. The corporation consists of a master, deputy-master, a certain number of acting elder brethren, with an unlimited number of younger brethren. The master and honorary elder brethren are chosen on account of eminent social position, and the other members from officers of the navy or the merchant service who possess certain qualifications. The corporation derives its revenue from lighthouse and other dues. Trinity House, on the north side of Tower Hill, London, was built in 1795.

**TRINITY SUNDAY**, the Sunday after Whitsunday. Its introduction as a festival of the church is somewhat late. It was definitely established by Pope John XXII. in 1334. All the principal feasts occur in the half-year between Advent Sunday and Trinity, and all the Sundays from Trinity to Advent, which may amount to twenty-five, or more or fewer, are called Sundays after Trinity.

**TRIO**, a musical composition for three voices or for three instruments. The same name is also applied to a movement in  $\frac{3}{4}$  time in a different key, which follows a minuet in a symphony and leads back to the original movement. This movement is also called *minuetto alternativo*.

**TRIE DE ROCHE.** See **LICHEN**.

**TRIPLE ALLIANCE.** Two treaties in European politics are known by this name. The first was formed in 1668 by Great Britain, Sweden, and the Netherlands against Louis XIV.; the second in 1717 by Great Britain, France, and Holland against Spain, then governed by Cardinal Alberoni. See the histories of the respective countries.

**TRIPLET**, in music, a combination of three notes to be played in the time of two. They are joined by a slur and distinguished by having the figure 3 above them.

**TRIPOD** (Latin, *tripos*; Greek, *tripous*, three-legged). This name, signifying generally any three-legged utensil, came to be applied to a bronze altar consisting of a cauldron raised on a three-legged stand of bronze. Such was the altar of Apollo at Delphi. It had a round flat plate on the top, on which the priestess sat when giving responses. Tripods of fine workmanship and of precious metal were

placed in later times as votive gifts in the temples, especially those of Apollo.

**TRIPOLI**, a country in the north of Africa, forming a portion of the Turkish Empire, having since 1835 been administered as a vilayet. It is bounded on the north by the Mediterranean, west by Tunisia, south by Fezzan and the Libyan Desert, and east by the Libyan Desert and Barca; area, estimated at 126,500 square miles. The Turkish vilayet of Tripoli includes Fezzan and Barca, and has an area of 344,000 square miles. The coast-line, which is 700 to 800 miles in length, including the Gulf of Sidra, or Greater Syrtis, has only one harbour, that of Tripoli, the capital. The eastern part of the interior, mostly a continuation of the desert, partakes of its character, and contains large tracts of almost barren sands. In the south, however, it is partly traversed by the Black Mountains, an eastern offset of the Atlas, which, descending in successive terraces, inclose many valleys and plains of considerable fertility. Farther to the west the surface becomes still more diversified, and presents scenery which is not deficient either in beauty or grandeur. Here the Ghurian Mountains stretch from west to east, nearly parallel to the coast. This range, which has a width of 12 to 15 miles, and attains a height of about 4000 feet, is not more than 20 miles from the coast, and becomes visible at sea. By far the richest tract of Tripoli is that which stretches about 15 miles along the coast, with a width not exceeding 5 miles, and has the capital nearly in its centre. The whole of this district is occupied with fertile fields, on which rich crops of wheat, barley, millet, and Indian-corn are grown; plantations of productive palm-trees, olive-yards, vineyards, orchards, and gardens. From the porous nature of the soil there are no proper rivers in the country, but abundant rains fall from November to March, and are collected in numerous tanks and cisterns to provide against the droughts which prevail throughout the remainder of the year. There are also artesian wells. From May to September the heat is intense, the sirocco often blows, and the thermometer rises as high as from 90° to 92°. Tripoli, like the other Barbary states, was formerly a nest of pirates, whose ravages were not entirely put an end to till the French conquest of Algiers. It had then long been independent, but in 1835 it was again brought under the rule of Turkey, and is governed by a Turkish pasha. The exports of the country include esparto, barley, ostrich feathers, ivory, &c. Pop. 1,150,000.

**TRIPOLI**, a seaport town on the northern coast of Africa, capital of the country of same name (see above), stands on a rocky promontory, is inclosed on the land side by a lofty wall flanked with bastions, and is defended by several forts. The town consists chiefly of a number of narrow and uneven streets, lined for the most part with mean houses huddled together without any order, and from the absence of front windows looking more like dead walls than inhabited dwellings. Many improvements have been effected in recent times; barracks, hospitals, prisons, &c., have been built by the government, as well as handsome business premises and residences by the European portion of the inhabitants. There are a number of mosques with tall minarets, and extensive bazaars and caravansaries. Water is now brought in pipes from wells outside the town, besides being collected in tanks when it rains. The only manufactures of any consequence are carpets and other woollen stuffs, and leather. The trade of the interior, as far as Timbuctoo and Bornou, has its emporium at Tripoli, to which the goods are conveyed across the desert by caravans. The exports comprise esparto, barley, ostrich feathers, sponges, ivory,

skins and hides, cattle, &c.; value of exports in 1901, £326,500. Pop. about 30,000.

**TRIPOLI**, **TARABOLUS**, or **TRIPOLIS**, a seaport town of Syria, a short distance from the Mediterranean, 48 miles north by east of Beyrout. It stands on a small triangular plain, near a hill crowned by a Saracenic castle. There are numerous mosques, and also Christian churches of various sects, a synagogue, and denominational schools. Groves of orange and other fruit-trees, carefully cultivated, abound in the plain, and silk ashes and soap are manufactured. The harbour, about 2 miles distant, at the village of El-Minâ, is small and unsafe, but it has a considerable trade in cottons, grain, wool, silk, and soap. Tripoli is unhealthy, especially at the end of summer, when fever is prevalent. Pop. 23,000.

**TRIPOLI**. See **CLAY**.

**TRIPOLITZA**, officially *Tripolis*, a town of Greece, capital of Arcadia, on a bleak and elevated plain more than 3000 feet above sea-level, 45 miles s.w. of Corinth, with which it communicates by rail. It is the seat of an archbishop, and has a gymnasium and priests' seminary. It occupies the site of the ancient Mantinea, Pallantion, and Tegea, and was captured by the Greeks on Oct. 5, 1821. Ibrahim Pasha held it from 1825 to 1828. Pop. (1896), 10,465.

**TRIEME**. See **GALLEY**.

**TRISMEGISTUS**. See **HERMES TRISMEGISTUS**.

**TRISMUS**, a species of tetanus affecting the under jaw with spastic rigidity; locked-jaw. There are two kinds of trismus, one attacking infants during the two first weeks from their birth, and the other attacking persons of all ages, and arising from cold or a wound.

**TRISTAN D'ACUNHA**, or **DA CUNHA**, the largest of three islands in the South Atlantic Ocean (the others, which are uninhabited, being Nightingale and Inaccessible Island), about 1300 miles south by west of St. Helena. It is a mountainous volcanic island, one peak rising to the height of 7640 feet. The climate is mild, and favourable to the growth of potatoes and other vegetables. The island contains good pasture, and cattle and sheep are reared by the inhabitants; poultry and pigs are also numerous. No corn is grown, its cultivation being given up on account of the ravages of mice. There is an abundance of excellent fish. The wind sometimes blows with such violence as actually to kill cattle. Ships seldom call. The island was taken possession of by Great Britain in 1817. Pop. in 1897, 64.

**TRITON**, son of Poseidon and Amphitrite, a sea-god. Tritons are also mentioned in the plural. They are variously described, but their body is always a compound of the human figure above with that of a fish below. They carry a trumpet composed of a shell, which they blow at the command of Poseidon to soothe the waves.

**TRITON**. See **NEWT**.

**TRIUMPH**, a solemn procession granted to a victorious general of ancient Rome. The triumph was the height of a Roman general's ambition, and the circumstances with which it was celebrated were of adequate splendour to the greatness of the occasion. The senate claimed the exclusive right of granting triumphs, although the grant had to be confirmed by the people. It was bestowed only on one who had held the office of dictator, consul, or prætor, and after a decisive victory over foreign foes, or on the complete subjugation of a province. On the day of the triumph all the temples were thrown open; every shrine was decorated with garlands, and every altar smoked with incense. The general assembled his soldiers without the city, delivered to them a commendatory oration, and distributed rewards and

money as their share of the spoil of the enemies. He then mounted his car and advanced to the triumphal gate (*porta triumphalis*), where he was met by the senate, and the procession was formed and marched along the *Via Sacra* to the capitol. It was led by the senate, headed by the magistrates, and included a train of carriages laden with spoils—models of captured forts and cities, pictures of the country conquered, trumpeters and flute-players, white bulls or oxen destined for sacrifice, attended by priests with their insignia and implements; the most distinguished captives, &c. The triumphant general rode in a circular chariot drawn by four horses; in his right hand he bore a laurel bough, and in his left a sceptre; he was attired in a gold-embroidered robe and a flowered tunic, and his brows were encircled with laurel. In the car he was accompanied by his children of tender age, and sometimes by very intimate friends. A public slave held over his head a gold Etruscan crown ornamented with jewels. The legates, tribunes, and equestrians, with the grown-up sons of the conqueror, followed on horseback. The infantry followed in marching order, their spears adorned with laurel, shouting, *Io triumphe!* singing hymns to the gods, and praising or ridiculing their general, according to the license of the day, as their humour might dictate. As the procession ascended the Capitoline Hill some of the captives were withdrawn from it and conducted to prison to be put to death. As soon as their execution was intimated the victims were sacrificed, offerings presented to Jupiter, and the general and his friends parted in the temple, returning home in the evening accompanied by flutes and torches and a crowd of citizens. Sometimes when the spoil was great the procession extended over more than one day. The *ovation* was a lesser triumph, so called because the sacrifice on the occasion was a sheep. The general entered the city on foot, and was not attended by the senate. He was preceded by flutes, but not by trumpeters, and was not necessarily accompanied by his army.

**TRIUMPHAL ARCH**, a monument consisting of a grand portico or archway erected at the entrance of a town, in its principal street, upon a bridge or in a public road, to the glory of some celebrated general, or in memory of some important event. The invention of these structures is attributed to the Romans. Of those existing at the present day some consist of a single arch, such as that of Titus at Rome (see Plate III. at **ARCHITECTURE**), of Trajan at Ancona, &c.; others are formed of two arches or arcades; and others of three. Many beautiful structures of this kind have been erected in modern times, but principally on the plan and in imitation of some one of the ancient arches.

**TRIUMVIRATE**, an office administered by three men (*triumviri*). When Cæsar was murdered Antony, Octavius, and Lepidus received power to restore order in the state: they were called *triumviri reipublicæ constituendæ*, and their office the *triumvirate*. The coalition between Cæsar, Pompey, and Crassus is also often, but improperly, called a *triumvirate*, as it was merely a union or conspiracy of three private men without the public sanction.

**TRIVANDRUM**, a town of India, the capital of Travancore state, Madras presidency, situated about two miles from the sea. The town is of considerable importance, has a fort containing the rajah's palace and other buildings, an ancient temple, college with European instructors, medical school, hospitals. Napier museum, various handsome buildings, and a military cantonment. Pop. (1901), 57,882.

**TRIVIUM**, the name given in the middle ages to the first three of the seven liberal arts—grammar,

rhetoric, and logic. The other four, consisting of arithmetic, music, geometry, and astronomy, were called the *quadrivium* (which see).

**TROAD.** See **TRAY**.

**TROCHILUS.** See **HUMMING-BIRD**.

**TROGLODYTES**, the name given by the Greeks to tribes living in subterranean caverns. The ancients mention some tribes of Troglodytes in Asia, Ethiopia, and Egypt, but give little information concerning them.

**TROGONS**, a well-known family of Insectorial Birds, belonging to the Fissirostral division of the order, but having the toes directed two in front and two behind—as in Scansorial or Climbing Birds. They inhabit both Old and New Worlds, but a single species only is known to occur in Africa. The Mexican Trogon (*Trogon Mexicanus*) is a familiar species found in North Mexico, and known by the bright green colour of the upper surface and the scarlet and yellow of the under parts. These colours predominate in all the New World species. The genus *Calurus* includes the Beautiful Trogon (*Calurus antiochianus*) and the Resplendent Trogon (*C. resplendens*, Plate I. at ORNITHOLOGY), both of which species are noted for the remarkable elongation of the shoulder-feathers, and also of those of the upper tail-coverts. The former inhabits South America, and the latter is found chiefly in Central America. All of these birds are insect-feeders. There are several other genera.

**TROLLOPE, ANTHONY**, a famous novelist, was the second son of Mrs. Frances Trollope, an almost equally prolific and popular author (see below), and was born 24th April, 1815. Educated chiefly at Harrow, where he learned little and spent, as he tells us, a number of unhappy years, he entered the post-office service as a clerk in 1834, and continued a diligent and highly efficient public servant in that department till 1867. In 1841 he was appointed to do post-office surveying work in Ireland, and it is in that country that the scenes of his earliest novels are laid. The Irish series, as they may be called, include *The Macdermots of Ballycloran* (1847), *The Kellys* and *the O'Kellys* (1848), and *Castle Richmond* (1860); and were but moderately successful. In 1850 he published *La Vendée*, a historical novel of some merit. His real popularity, however, began with the series in which he painted clerical and country society with great minuteness, fidelity, and good-humour; this series comprehends *The Warden* (1855), *Barchester Towers* (1857), *Doctor Thorne* (1858), *Framley Parsonage* (1861), and *The Last Chronicle of Barset* (1867). Another clearly marked group is constituted by what may be termed his political novels, commencing with *Can You Forgive Her?* (1864), *Phineas Finn* (1869), *Phineas Redux* (1873), and *The Prime Minister* (1875). Among the more important of his less strictly classifiable novels are *Orley Farm* (1862), *The Small House at Allington* (1864), *The Claverings* (1867), *The Struggles of Brown, Jones, and Robinson* (1870), *The Eustace Diamonds* (1873), *The Way we Live Now* (1875), *The American Senator* (1877), and many others, three of which were published after his death. As a writer of travels he also holds a respectable place, and his books on the West Indies, the United States, the Australian colonies, and South Africa contain much entertaining and instructive matter. His *Life of Cicero*, and a little work on *Cæsar*, are fair specimens of literary workmanship in a different field. He died 6th December, 1882, leaving behind him a very interesting Autobiography, which was published in 1883.—**THOMAS ADOLPHUS TROLLOPE**, the elder brother of the above (born 1810), is the author of a good number of novels (*La Beata*, *Beppo*

the Conscript, *Lindisfarn Chase*, &c.), several histories (the chief being *The History of the Commonwealth of Florence*), biographies (*Life of Pius IX.*, &c.), reminiscences, &c. He died in 1892.

**TROLLOPE, FRANCES**, an English novelist, born in 1780; died at Florence, Oct. 6, 1863. She was the daughter of a clergyman named Milton, and in 1809 married a barrister named Thomas Anthony Trollope. The marriage proved an unhappy one, and in 1829 she was left a widow with six children. After the death of her husband she went to America, where she tried to establish some kind of business in Cincinnati, but not succeeding she came back at the end of three years to England, where she turned her residence in America to account by publishing a book on the Domestic Manners of the Americans (1832). The work was read with avidity on her own side of the Atlantic, where it procured her the reputation of a clever and pungent, if somewhat prejudiced, satirist, although in America it is regarded as a broad and rather offensive caricature. Mrs. Trollope followed up this first success with a long series of works, chiefly novels, becoming perhaps the most voluminous novelist of her day. During the course of her literary career she travelled a good deal on the Continent, which furnished her with material for various works, containing an account of her adventures and the results of her observations. About 1844 she went to Italy, where her son Thomas Adolphus (himself a distinguished *littérateur*) was residing, and in that country she passed the greater part of the remainder of her life. The most successful of her novels is said to be *The Widow Barnaby* (1839), with its sequels *The Widow Married* (1840), and *The Barnabys in America, or Adventures of the Widow Married* (1843). Among her other novels may be mentioned *Tremor-dyn Cliff*; *The Vicar of Wrexhill*; and *Fashionable Life, or Paris and London*, her last work, published in 1856. See preceding article.

**TROMBONE**, a musical instrument of the trumpet kind, formerly called the sackbut. It is a large deep-toned instrument with sliding tubes, and is capable within its compass of producing every sound of the chromatic scale in perfect tune. In the orchestra three trombones are used, which harmonize with each other. The range of the alto trombone is from C above the second line of the bass to G above the treble staff; that of the treble trombone is from B, the second line of the bass, to A above the second line of the treble; that of the bass from C, the second line below the bass staff, to G, the second line of the treble.

**TROMP, MARTIN HARPERTZDOON**, a celebrated Dutch admiral, was the son of a Dutch naval officer, and was born at Briel in 1597. He went to sea with his father in 1607. His father was killed soon after, and he was taken prisoner by the English. After recovering his liberty he served in various subordinate capacities, and remained for a time in retirement. In 1637 he received the appointment of lieutenant-admiral, and served with great success against the Spaniards. On 21st October, 1639, he gained a decisive victory over the Spanish and Portuguese fleet near Dunkirk. After a doubtful engagement with Blake on 19th May, 1652, he was superseded by De Ruyter, but was soon after reinstated, and with a superior fleet defeated Blake on 29th November. He was again encountered in the Channel by Blake and Monk in February, 1653, without decisive results. On the 3d and 4th of June other indecisive engagements took place, and on the 29th July he fought his last battle with Monk. It was obstinate and closely contested, but the English were successful, and the Dutch lost their admiral, who was killed in the battle.—His son, **CORNELIS**

VAN TROMP, born at Rotterdam in 1629, was also distinguished in the naval service of his country. He died in 1691.

TROMSÖ, a seaport town in the north of Norway, capital of the province of Tromsö, pleasantly situated on a small island off the west coast. It is important on account of its fisheries, and it has an extensive trade in dried and smoked fish, herrings, train-oil, &c. It is the see of a bishop, and has a town-hall, a Protestant and a Roman Catholic church, a museum, &c. Pop. (1891), 6079.

TROND, Sr. (Flemish, *Sint-Truyden*), a town of Belgium, in the province of Limburg, 10 miles south-west of Hasselt. It has a town-house with a lofty quadrangular tower, a college, an hospital, &c. It has tobacco-works, sugar-factories, breweries, and distilleries. Pop. 14,000.

TRONDHJEM, or THRONDHJEM (German, *Drontheim*), a seaport town on the west coast of Norway, the ancient capital of the country, beautifully situated on a bay at the mouth of the Nid, on the south side of the Trondhjem-fiord. It has spacious, regular, and remarkably clean streets, the houses being chiefly of wood. The most remarkable edifice is the cathedral, which mainly dates from the latter part of the twelfth to the end of the thirteenth century, and is entitled to rank, as a whole, as the most remarkable ecclesiastical structure in the kingdom; it has long been undergoing extensive restorations. Among other buildings are a residence of the royal family, an academy of science, containing a valuable library and antiquarian collections, an arsenal, &c. The manufactures are not of much importance, but there are breweries, distilleries, paper-mills, and ship-yards. A new harbour has recently been constructed, and two railways now terminate here. The trade consists chiefly in exports of timber, dried and salted fish, tar, and copper. Pop. (1901), 38,180.

TROON, a seaport in Scotland, on the coast of Ayrshire, and between 5 and 6 miles north of Ayr. It is pleasantly situated on a promontory projecting into the sea, and is neatly built, containing many handsome villas and cottages, chiefly for the accommodation of summer visitors, Troon being a favourite sea-side resort. The principal trade of the port is the exportation of coal and pig-iron; and ship-building is carried on. Pop. (1891), 3786; (1901), 4764.

TROOP, in the army, a body of cavalry, usually consisting of sixty troopers under the command of a captain and two lieutenants. A squadron is composed of two troops.

TROPEOLACEÆ, a natural order of plants, consisting of smooth, herbaceous, trailing or twining plants, with alternate leaves without stipules, axillary one-flowered peduncles; yellow, scarlet, orange, or even blue flowers; three to five sepals, usually valvate; one to five petals; six to ten free perigynous distinct stamens with two-celled anthers, a single three-cornered ovary, and an indehiscent fruit containing large seeds without albumen. This order is now often included in the Geraniaceæ. All the plants are natives of the temperate parts of North and South America. They are generally acrid, pungent, and antiscorbutic. The unripe fruit of *Tropeolum majus*, commonly known as Indian-cress or garden nasturtium (taking the name *nasturtium* from the similarly pungent water-cress), is frequently pickled and employed as a substitute for capers. This plant is said to have been brought from Peru in 1686, while *T. minus* came from the same country as early as 1586; both being hardy annuals and very well known in gardens. *T. speciosum*, a perennial species with scarlet flowers, brought from Chili in 1841, grows almost like a weed in some parts, especially in Scotland. *T. peregrinum*,

a pretty yellow-flowered species, is known as the Canary creeper. Most of the species have tuberous roots, some of which are edible, as *T. tuberosum*.

TROPÆOLUM. See preceding article.

TROPICAL YEAR. See YEAR.

TROPIC-BIRD (*Phaeton*), a genus of Natatores or Swimming Birds, included in the family Pelecanidæ and in the sub-family Phaetoninæ. The bill in these birds is sharp, curved superiorly, and is as long as the head. The two middle feathers of the tail are very long and narrow. These birds inhabit the tropical seas, and can fly for days together without resting on land. The cry is loud and shrill, hence sailors call these birds by the name of Boatswains. The common species is the *Phaeton aethereus*, which averages about 2½ feet in length, the elongated tail-feathers being about 15 inches in length. This bird breeds in Mauritius. Another well-known species is the Roseate Tropic Bird (*P. phaniscurus*). See Plate VII., fig. 19, at ORNITHOLOGY.

TROPICS, in astronomy, two circles on the celestial sphere, whose distances from the equator are each equal to the obliquity of the ecliptic, or 23½° nearly. The northern one touches the ecliptic at the sign Cancer, and is thence called the *tropic of Cancer*, the southern one being for a similar reason called the *tropic of Capricorn*. The sun's annual path in the heavens is bounded by these two circles, and they are called *tropics* (Greek, *τροπή*, a turn), because when the sun, in his journey northward or southward, reaches either of them, he, as it were, *turns back*, and travels in an opposite direction in regard to north and south. Geographically the tropics are two parallels of latitude, each at the same distance from the terrestrial equator as the celestial tropics are from the celestial equator. The one north of the equator is called the *tropic of Cancer*, and that south of the equator the *tropic of Capricorn*. Over these circles the sun is vertical when farthest north or farthest south, that is, at the solstices (or midsummer and midwinter, 21st June and 21st Dec.), and they include between them that portion of the globe called the torrid zone, a zone 47° wide, having the equator for its central line. See ECLIPTIC, DAY, &c.

TROPFAU, a town of the Austrian Empire, capital of Silesia, on the Oppa, 78 miles north-east of Brünn. It is well built, containing handsome squares, and consists of an inner town, with pleasure-grounds on the site of the former fortifications, and of three suburbs. It contains some handsome public buildings, several fine churches, an upper gymnasium, a museum, a library of 35,000 volumes, an upper real-school, and other educational institutes. It manufactures woollen and linen cloth, beet-root sugar, beer, liquors, paper. A congress of sovereigns was held here in 1820, occasioned by the revolutions of Spain, Portugal, and Naples. Pop. (1900), 26,725.

TROSSACHS. See KATRINE (LOCH).

TROUBADOURS. See PROVENÇAL POETS.

TROUT, a name applied to various species of fish, belonging to the genus *Salmo*, family Salmonidæ, but also given to other fishes. Very many species and varieties of Trout are found. The Trout distinctively so-called is the *Salmo fario* of naturalists (see Plate III. at ICHTHYOLOGY), occurring as a characteristic fresh-water fish in Britain and in almost all the rivers and lakes of Northern Europe, being even found in the smallest streams, and presenting variations in colour which are probably due to differences in habits, locality, and feeding. The general and most usual colour is a yellowish-brown above, marked with dark reddish-brown spots, whilst spots of brighter red exist along the lateral line of the fish. The lower parts of the sides are golden-yellow, the belly being silvery-white. A trout

weighing a pound is considered a good fish, and though a weight far in excess of that is frequent, many streams produce none so large. Worms, flies, and insects, or small animals of any kind, are the food of the trout. The trout is a favourite fish with the angler, and is protected by law during the winter season (in Scotland only since 1902). It spawns about the latter part of October and in November. The Loch Leven trout is a distinct species (*S. levenensis*), and some regard the Great Lake trout (*S. ferox*) as distinct from the common trout. Other trout are the Bull or Gray Trout (*Salmo eriox*), common in the Tweed, and the Salmon Trout (*Salmo trutta*). America has several species of large lake-trout, the common American brook-trout being *S. fontinalis*. See SALMON, SALMONIDÆ, &c.

**TROUVÈRE.** See FRANCE—Literature.

**TROVER**, in English law, an action against a man who is in possession of the goods of another, and refuses to deliver them to the owner, or sells or converts them to his own use without the consent of the owner. It was originally confined to cases in which one man had actually found the goods of another and refused to deliver them on demand, but converted them to his own use.

**TROWBRIDGE**, a market-town of England, in the county of Wilts, 25 miles north-west of Salisbury, on a rock eminence in the valley of the river Biss. The houses are generally old and indifferently built. In the parish church, a fine building in the Perpendicular style dating from the fourteenth century, the poet Crabbe officiated from 1814 until his death in 1832, and a fine monument is here erected over his remains. The principal manufacture is that of woollen cloths; engineering and brewing are also carried on. Pop. (1891), 11,717; (1901), 11,526.

**TROY**, or **ILIUM** (Greek *Troia* or *Iliou*), a famous ancient city in the north-west of Asia Minor, not far from the Ægean Sea and the Hellespont. This region—the ancient Troad—is for the most part mountainous, being intersected by Mount Ida and its branches. There have been various opinions respecting the site of the ancient city, and many efforts made to reconcile the present topography with the geographical statements made in the Homeric poems and other ancient writings. The most probable opinion seems to be that which places the original city at the head of the plain bounded by the modern river Menderes, supposed to be the Scamander of Homer, and the Dombrek, probably the Homeric Simois. The Ilium of history was founded, according to Strabo, about 720 B.C. by Æolic Greeks, on an offshoot of Mount Ida, on the site, as they doubtless believed, of the 'sacred city', a few miles south-east of the bay into which the Scamander falls. This bay, at the entrance of the Hellespont, is the only place where such a fleet as that described by Homer could have effected a permanent landing. New Troy (Ilium Novum) was visited and favoured by Alexander the Great, but it did not become a place of importance until the arrival of the Romans in Asia, and its later history is of little interest. It is now represented by ruins at a place called Hissarlik. Nearly all antiquity believed that New Troy occupied the site of Old Troy, and most moderns have taken the same view. This topographical question has been debated by Welcker, Ueber das Homerische Iliou (Bonn, 1845); Maclaren, The Plain of Troy described (Edinburgh, 1863); Schliemann, Ilios (1881), and Troja (1883); Normand, La Troie d'Homère (1892); and others. Schliemann's excavations at Hissarlik in 1871–82 and 1890, and those of his co-worker and successor, W. Dörpfeld, have established the successive existence of several ancient cities there. Of

these the lowest and oldest belongs almost wholly to the stone age, and the second lowest, which must have been destroyed by fire, was identified by Schliemann with the Troy of Homer. Professor Bury considers that the Homeric Troy corresponded to the sixth city built on this site, and that its fall was consequent on the Greek colonization of Asia Minor. According to him 'we know with full certainty who the people of Troy were; we know that they were a Phrygian folk and spoke a tongue akin to our own. The six cities of Troy perhaps correspond to successive waves of the Phrygian immigration from south-eastern Europe into north-western Asia Minor, an immigration which seems to have extended over the third, and early portion of the second, millennium'. The excavations here and those carried out elsewhere by Schliemann are of the utmost importance in the study of the Homeric problems, but the many questions raised by them are as yet very far from having received a final answer. (See Schuchhardt's Schliemann's Excavations, 1891.)

The mythical, legendary, or poetical account of the rise and fall of the Trojan kingdom is briefly as follows:—Teucer, the first king of the Troad, had a daughter who married Dardanus. From Tros, the grandson of Dardanus, the country and people derived the names Troas and Troës, and from his great-grandson Ilius the city which he founded derived its name Ilium. Laomedon was the son and successor of Ilius, and on the death of this king his son Priam succeeded him. The abduction of Helena, wife of Menelaus, king of Sparta, by Paris, one of Priam's sons, brought on the siege of Troy. (See PRIAM, PARIS, HELENA, &c.) To revenge this outrage all the Greek tribes afterwards famous in history banded themselves against the Trojans and their allies the Lycians, Mysians, Lydians, &c. The Greeks spent ten years in equipping a fleet of 1186 vessels, containing over 100,000 warriors commanded by Agamemnon. The first nine years of the war were spent by the Greeks in driving the Trojans and their allies within the walls of the capital, and in reducing the surrounding towns. The tenth year brought about the quarrel between Achilles, the bravest of the Greeks, and Agamemnon, which proved so disastrous to their party, and which forms the subject of the Iliad. The Trojans, headed by Hector, drove the besiegers back to the coast, and killed Patroclus, the intimate friend of Achilles. This roused Achilles from his inactivity; he once more rushed into the fight, forced the Trojans again behind their walls, and killed Hector, their bravest champion. Achilles was, however, slain by an arrow from the quiver of Paris, and once more the Greeks were threatened with disaster. But they now constructed an immense hollow wooden horse, in which a number of the Greek heroes concealed themselves. The horse was drawn out into the plain before Troy, and the Greeks withdrew to their ships as if they had abandoned the siege. The Trojans incautiously drew the horse within the city, and gave themselves up to a night's wild revelry. The Greeks within the horse now issued from their concealment, and being joined by their companions without the walls, Troy was taken and utterly destroyed. Æneas and Antenor with their families were among those who escaped the general massacre. The destruction of the city is said to have occurred about 1184 B.C.

**TROY**, a town of the United States, capital of Rensselaer county, New York, 151 miles north of the city of New York, on the left bank of the Hudson river. It is regularly built in spacious streets crossing at right angles and opening into fine public squares; and has a fine court-house, a lyceum with a museum, a celebrated female institute, a polytechnic



institute, a new public library, a government arsenal, &c. The Hudson furnishes power to furnaces and forges, paper, saw, cotton, and flour mills. Other manufactures are cotton and woollen goods, railway rolling-stock, collars, shirts, &c., and there are large laundries. Troy is an important railway centre. Large quantities of lumber, flour, grain, beef, pork, wool, &c., besides manufactured goods, are shipped. Pop. (1900), 60,651.

TROYES, a town of France, capital of the department of Aube, and formerly of the province of Champagne, 103 miles S.E. of Paris by rail, on the left bank of the Seine. Many of the streets are narrow and irregular, and lined with antiquated wooden houses; but these buildings are gradually giving way to others of modern construction. The principal edifices are the cathedral, a splendid specimen of florid Gothic; the churches of St. Urbain, regarded as a model of light, airy Gothic, of St. John, and of St. Madeleine, in the flamboyant style; the *hôtel-de-ville*, the prefecture, the hospital, museum, *palais-de-justice*, and public library, containing 100,000 printed volumes and nearly 5000 MSS. The manufactures consist of cottons, woollens, hosiery, soap, artificial flowers, paper, gloves, &c. There are numerous worsted and cotton mills. It carries on an important trade in grain, wine, brandy, colonial produce, famous sausages, hemp, wax, wool, wood, iron, lead, zinc, &c. The town was in existence previous to the conquest of Gaul by the Romans, by whom it was called *Augustobona*. The Treaty of Troyes between Charles VI. and Henry V. of England was concluded in 1420 (see ENGLAND, p. 169). Nine years after, the English were expelled by Joan of Arc. Pop. (1901), 53,159.

TROY WEIGHT, a scale of weight used in Britain for weighing gold, silver, precious stones, &c., and legally established for determining the weight of coins. Neither the etymology nor the date of the introduction of this denomination is at all certain. By some the term troy weight is supposed to be derived from Troyes, in France, which, like Cologne and other continental towns, may have had its own system of weights; indeed, it is asserted that such a system was brought from Cairo to Troyes by the Crusaders, and thence to England by the goldsmiths. The unit and only standard of weight is the troy pound, one-twelfth part of which is an ounce, one-twentieth part of such ounce is a pennyweight, and one-twenty-fourth part of such pennyweight is a grain; thus 5760 grains are a troy pound, while 7000 such grains are a pound avoirdupois. Formerly a different subdivision of the troy pound was used by apothecaries, but medicines are now weighed by the avoirdupois scale. The standard troy pound, if lost, might be restored by reference to the weight of a cubic inch of distilled water, which, weighed in air by brass weights at the temperature of 62° Fahr., the barometer being at 30 inches, is equal to 252.458 grains, while the troy pound contains 5760 such grains.

TRUCE, a temporary suspension of hostilities between two armies or states for negotiation or other purposes. By the laws of war none of the contending parties are allowed to take up a more favourable position during a truce or so to act as to secure advantages over the enemy which they had not at the commencement of the truce. A truce to become binding requires the sanction of the commander-in-chief, but may be ended before the period previously agreed upon on due notice being given to the opposite party.

TRUCE OF GOD, in the middle ages, a limitation of the right of private warfare introduced by

the church in order to mitigate an evil which it was unable to eradicate. This truce of God provided that private feuds should cease, at least on the holy days, from Thursday evening to Sunday evening in each week; also during the whole season of Advent and Lent, and on the octaves of the great festivals. This salutary regulation was first introduced in 1033 in Aquitaine, then in France and Burgundy. Under William the Conqueror it was introduced into England, and in 1071 into the Netherlands. At many councils it was a chief subject of discussion, and was enjoined by special decrees. At a later period the truce of God was sometimes extended to Thursday. Whoever engaged in private warfare on the prohibited days was excommunicated. The truce of God was also extended to certain places, as churches, convents, hospitals, churchyards, &c., and certain persons, as clergymen, peasants, merchants, pilgrims, and, in general, all defenceless persons. At the Council of Clermont (1095) it was made to include all Crusaders. This institution was entirely abolished when the rulers of the various countries became strong enough to curb effectually their turbulent and powerful subjects.

TRUCK SYSTEM, an arrangement by which an employer pays his workmen in goods instead of in money—a practice that extensively prevailed, and to some extent still prevails, in the mining and manufacturing districts of Great Britain. The plan has been for the employers to open shops or stores, and the workmen have either got their wages accounted for to them by supplies of goods from such establishments without receiving any money, or they have been paid the money with the understanding, implied or expressed, that they were to purchase their provisions, clothes, &c., at the premises opened by the masters for that purpose. The system offers great facilities for fraudulent dealing. In too many cases it has been the practice to supply goods at first on liberal terms, and the workmen have been induced to purchase to such an extent in anticipation of wages that they soon run into debt. They then cease to be free agents, as they are compelled to take such goods and at such prices as the master pleases. The only resource by which they can escape from this thralldom is to quit their employment and remove to some other place. In many instances the profits of the truck shop became a source of considerable revenue to the employers, and thousands of workmen, whose nominal wages were 30s. a week, did not really receive, owing to the bad quality and high price of goods supplied, more than 20s., and frequently not so much. A remedy for such a scandalous state of matters was long and loudly called for, and at last the system met a severe check by Lord Hatherton's act, 1 and 2 William IV. cap. xxxii., which abolished the system in mining and manufacturing centres. This has been extended and amended by an act passed in 1887.

TRUFFLE (*Tuber*), a genus of mushrooms (Fungi), remarkable for their form, and for growing entirely under ground, at the distance of a few inches from the surface. Only a few species are known, which are found chiefly in temperate climates. Some of them have the rind rough, with small tubercles; others have it entirely smooth. They attain the diameter of 2 or 3 inches. The Common Truffle (*T. cibarium*), so celebrated in the annals of cookery, is said to inhabit all the warm and temperate parts of the northern hemisphere, although its existence in North America is doubtful. The best are imported from France, Italy, and Algeria. In certain districts it is astonishingly abundant, as in Piedmont, and at Perigord, in France, which latter place has in consequence acquired celebrity for producing them. They



abound most in light and dry soils, especially in oak and chestnut forests; but it would be difficult to procure them anywhere were it not that hogs are extremely fond of them, and lead to their discovery by rooting in the ground. Dogs are sometimes taught to find this fungus by the scent and to scratch it up out of the ground. The season for collecting continues from October to January. The truffle is usually about as large as an egg; is entirely destitute of roots; the skin blackish or gray, studded with small pyramidal warts; the flesh, white, gray, or blackish, varied with black or brown veins. They are commonly preserved in oil. They may be kept in ice or covered with lard; in some countries they are dried. They were in use among the ancient Greeks and Romans.

**TRULLAN COUNCIL.** See **CONSTANTINOPLE** (GENERAL COUNCILS OF).

**TRUMPET**, a musical wind-instrument, known in all ages and countries, generally made of brass, and sometimes of silver. The orchestral or slide trumpet consists of a tube about  $5\frac{1}{2}$  feet long, twice curved, and ending in a bell. The slide is on the second curve. The scale of the slide trumpet begins with A sharp in the first space of the bass stave, and extends to C above the treble stave, but C below the bass stave can be produced. The natural notes are C (below bass), C (octave), G, middle C, E, G, B flat, C, D, E, F, G, A, B flat, B, C. A univalve trumpet was introduced by Mr. Bassett in 1876. The addition of the valve greatly improves the slide trumpet in respect of accuracy and completeness without injuring its characteristic tone in any way. The trumpet, from its exciting effect, is well-fitted for military music.

**TRUMPET, HEARING.** See **EAR-TRUMPET**.

**TRUMPET, SPEAKING.** See **SPEAKING-TRUMPET**.

**TRUMPETER** (*Paophia*), a genus of Grallatorial or Wading Birds, found in South America, and so named from their hollow cry, which results from the peculiar conformation of the windpipe or trachea. The most familiar species is the Golden-breasted Trumpeter (*P. crepitans*), which is readily tamed, and becomes a favourite inmate of the house. The head and neck are velvety-black; the breast is glossy-green; the back gray; and the wings, tail, and under parts black. The eggs, numbering ten or twelve, are light-green in colour, and are deposited in a mere hole scratched in the ground.

**TRUMPET-FISHES**, a name sometimes given to the Pipe-fishes (which see). The name Sea-trumpet is also applied to the *Triton variegatus* or Conch-shell, a large genus of Gasteropodous Molluscs, which is employed as a horn or trumpet by the South Sea Islanders.

**TRUNK-FISHES**, the name given to several curious Teleostean fishes belonging to the sub-order Plectognathi, and forming the family Ostracientidæ. The body in these fishes is inclosed in a solid immovable case of large ganoid plates, the tail alone being mobile; and this ossified condition also extends to the skeleton of the head. The Horned Trunk-fish (*Ostracion cornutus*) is a familiar example of this group, the members of which chiefly occur in tropical seas. (See **ICHTHYOLOGY**, Pl. III. fig. 21.)

**TRURO**, an episcopal city and municipal borough of England, in the county of Cornwall, at the confluence of the Kenwyn and St. Allen,  $10\frac{1}{2}$  miles N.W. of Falmouth. The principal edifices are a magnificent new cathedral and a range of public buildings comprising an assembly-room, libraries and reading-room, &c. There are here a grammar-school, a free library, a mining-school, the museum of the royal Institution of Cornwall, and the Central Technical School for the county of Cornwall. Vessels

of about 100 tons can come up to the town; and tin and copper ore are exported, and iron, coal, timber, &c., imported. Truro ceased to be a parliamentary borough in 1885. Pop. (1891), 11,181; (1901), 11,562.

**TRUSS**, in surgery, a bandage or apparatus employed in ruptures (see **HERNIA**) to keep up the reduced parts and hinder a fresh protrusion. A truss ought so to compress the neck of the hernial sac, and the ring or external opening of the hernia, that a protrusion of any of the contents of the abdomen may be completely prevented. It should make an equal pressure on the parts without causing inconvenience to the patient, and be so secured as not easily to slip out of its right position. Every truss consists of a pad for compressing the aperture through which the hernia protrudes, and of another pad which is applied to the spine, and a steel spring for keeping up the pressure; to these are sometimes added a thigh-strap and a scapulary, which passes over the shoulder.

**TRUSTEE**, a person to whom property is legally committed in trust, to be applied either for the benefit of specified individuals or for public uses. The person for whom or in whose favour the trustee holds the estate, or any interest therein, is called the *cestui que trust*. Trusts are generally raised by marriage settlements or by wills. The ordinary trusts in the former case, as to real estate, are, in the first place, for securing to the wife payment of her pin-money during marriage, and of her jointure on her becoming a widow; then for raising the stipulated provisions for younger children, and also for providing for their maintenance while minors. Trusts are commonly raised in wills for the maintenance or advancement and portioning of children. Trustees may be declared verbally as regards personal estate, but as to land writing is necessary. No one is compelled to undertake a trust, but if he once accept he cannot renounce it unless the trust-deed contains a provision enabling him to do so, or the Chancery Division grants him a discharge, or by the consent of all those beneficially interested in the estate. Trustees are bound to act in strict accordance with the terms of the trust and the rules of the Chancery Division, and are liable for the consequences of any breach of trust. However, by the Judicial Trustees Act of 1896 the High Court may relieve a trustee from personal liability, either wholly or partly, if he has acted honestly and reasonably. They are accountable for the interest which they do or might make from the employment of the money in their possession, as also for the whole profits they may derive from trading with the trust fund. As their office is considered purely honorary, they are not entitled to any allowance for their trouble in connection with the trust. Trustees are liable for any misapplication of the trust fund arising either from ignorance of facts which they might by common diligence have known, or from ignorance of the law in any case, even though they may have acted in good faith and in reliance on the opinion of eminent legal advisers; but they may apply for advice by petition to a judge of the Chancery Division, or by summons to a judge at chambers, and so be absolved from responsibility. By the Trustee Act of 1893 trustees were given power to select from a wider list of securities than was formerly permissible, but subject to the limitations of the trust-deed. The estates of trustees deceased are liable in the case of fraudulent administration. The appropriation of the trust fund by the trustee to his own use makes him liable to prosecution and punishment by imprisonment. The above-mentioned Act of 1893, which does not apply to Scotland, repealed, but substantially

re-enacted, most of the Trustee Act of 1888, and provides for lessening the personal responsibilities of trustees who act in good faith. By the Judicial Trustees Act of 1896 the High Court, or any County Court judge with jurisdiction under the act, was given power, on application by a person desirous of creating a trust or by a trustee or beneficiary of an existing trust, to appoint a paid judicial trustee to act either along with another person or as sole trustee, and, if cause be shown, in place of the existing trustees. This act does not apply to Scotland or Ireland, or to charitable trusts. See Birrell's Duties and Liabilities of Trustees (1896).

**TSARSKO-SELO, or ZARSKOYE-SELO** ('Czar's Town'), a town of Russia, in the government of St. Petersburg, and 14 miles south of the capital, with which it is connected by rail. It is the favourite summer residence of the imperial family, and was founded by Peter the Great. In 1744 the Empress Elizabeth erected the magnificent palace, which Catharine II. decorated at great expense. The principal front is about 1000 feet long. The interior is gorgeously ornamented, the walls of some of the rooms being covered with amber, mother-of-pearl, jaspers, agates, and other precious stones. This palace has not been for many years the residence of the imperial family; they have preferred a less pretentious building, erected by Alexander I. The palace grounds, which are 18 miles in circumference, are finely laid out, and offer every variety of landscape. Pop. 20,000.

**TSETSE-FLY** (*Glossina morsitans*), a genus of Diptera or flies, belonging to the family of the Tabanids or Gad-flies, and noted for its deadly effects on horses, dogs, and cows. This fly is especially South African in its distribution, and appears to be innocuous to man and to wild animals. It is an insect of about the size of our common house-fly, or perhaps a little larger; it is of a brown colour, with a few yellow stripes across the abdomen. A curious gland, secreting a poisonous fluid, exists within the mouth. A single bite appears sufficient to cause death in the horse, ox, or dog, but it is equally curious to note that the nearly-allied goats, mules, and asses, do not appear to suffer from the bite of the tsetse. It is said to be absent from districts in which the buffalo has been exterminated. The symptoms of tsetse-bite are at first those of a severe cold, the eyes, nose, and mouth beginning to 'run', the body then swells, whilst emaciation sets in. The fly seldom bites at night, and it appears never to approach close to a river side, so that animals conveyed by water usually escape its attacks.

**TUAM**, an ancient town of Ireland, in the county of Galway, Connaught, 126 miles west by north from Dublin. It is the seat of the Bishop of Tuam, and also of the Roman Catholic archbishop. Its principal edifices are the Protestant and Roman Catholic cathedrals, the bishops' palaces, the college of St. Jarlath, for the education of Roman Catholic clergy; the court-house, bridewell, National and other schools. The manufactures are confined to canvas and a few coarse linens, but the trade in grain is considerable. Pop. (1881), 3567; (1891), 3012; (1901), 2896.

**TUARICKS, TUAREGS, or TAWARIKS.** See **BERBERS and SAHARA.**

**TUBER**, in botany, a short and fleshy subterranean stem (often erroneously called a root), consisting of a mass of starchy substance, which affords a supply of nutritious matter for the future germ in the spring, and protects it from the cold during winter. They are more or less numerous, as in the Jerusalem artichoke and potato, and are attached to the true root at different points, sometimes in the middle, sometimes at the extremities. They belong

exclusively to perennial plants, and may be used for the propagation of the plant by division into portions, each containing an eye or bud. Arrow-root is obtained from the tubers of the *Maranta arundinacea*, and many other tubers form articles of food.

**TUBERCULOSIS.** See **SUPPLEMENT.**

**TUBEROSE** (*Polyanthus tuberosa*), a plant of the natural order Liliaceae. This highly odorous and favourite flower was introduced into Europe from the East Indies about the middle of the sixteenth century. Though almost purely an ornamental plant, its culture is now so extended that the roots form a considerable article of export from the southern to the northern parts of Europe. The root is a rounded bulb; the radical and inferior leaves are long, almost sword-shaped, and very acute; the stem upright, unbranching, and 3 or 4 feet high. The flowers are disposed in a simple and more or less elongated spike, and are of a very pure white: the tube of the corolla is a little curved, and divides into six oval obtuse lobes. The flowers expand successively, so that they continue nearly three months, and their fragrance is emitted mostly after sunset. The essential oil is used by perfumers.

**TUBES OF FORCE.** Conceive a small area of an electrified surface and the lines of force which spring from it; if we consider the lines of force which spring from the boundary of the area as forming the bounding surface of the tube the whole bundle of lines of force may be called a tube of force. In a tube of force the total force at all sections is the same, so that where the tube widens the force intensity is weakened. In the case of an electrified sphere the tubes of force are tapering to a point at the centre of the sphere.

**TUBICOLA**, an order of Annelida or Worms distinguished by the fact of its members secreting or manufacturing tubes of various kinds for the protection of their bodies. The familiar *Serpula* (which see) thus make hard tubes of lime, as also does *Spirorbis* (which see); whilst *Terebella* and *Sabella* make tubes of sandy materials.

**TÜBINGEN**, an old town of Württemberg, in the circle of the Schwarzwald, situated in a valley on the Neckar, 16 miles south-west of Stuttgart. The town is somewhat irregularly built, and the streets are for the most part steep and narrow, but the environs are finely diversified by hill, dale, and forest. There are some woollen and linen manufactures, as also dye-works, saw and other mills, but the town is supported chiefly by the university, which was founded by Eberhard im Bart, first Duke of Württemberg, in 1477, and received very important improvements in 1769. It has a library of 250,000 vols., a botanic garden, a chemical laboratory, collections of zoology and comparative anatomy, of minerals, of coins and antiquities, gymnastic and swimming schools, and an average attendance of about 1200–1400 students, receiving instruction from about eighty ordinary and extraordinary professors, lecturers, &c. Among the celebrated names connected with the professorships of this university are Reuchlin, Melancthon, and in the nineteenth century Baur, the founder of the new Tübingen school of theology. The first mention of Tübingen in history is in the year 1078. Pop. of the town in 1890, 13,275; in 1900, 15,338.

**TUBIPORA**, a genus of Corals or Actinozoa, belonging to the order Alcyonaria, and represented by the familiar Organ-pipe Coral (*T. musica*), and by other species. In these Corals the *Sclerodermis* (which see) variety is well represented. The little polypes have each eight fringed tentacles, and are of a bright green colour, which contrasts markedly with the dark red of their investing coral.

**TUBULAR BRIDGE.** See **BRIDGE (TUBULAR).**

**TUBULARIA**, a well-known genus of Hydrozoa or Zoophytes (see COELENTERATA), included in the order Corynida or Tubularida. The organism consists of a collection of tubes either unbranched, or very slightly so, each of which contains a single polypite. The tubes are straw-coloured, and the colonies of Tubularia are sometimes hence known as 'Pipe-coralines.' The animals themselves are of red colour, and are provided with two sets of tentacles. The generative buds or bodies exist at the bases of the tentacles, and appear as medusæ-like bodies. *Tubularia indivisa* is a familiar species.

**TUCUMAN**, or **SAN MIGUEL DE TUCUMAN**, a town of the Argentine Republic, capital of the province of same name, with tanneries and sugar-works, distilleries, &c. Pop. in 1895, 34,305.

**TUDELA**, a city of Spain, in the province of Navarre, 156 miles north-east of Madrid, in a plain on the right bank of the Ebro, at the junction of the Queiles. It is a neat but dull place, with narrow streets and solidly-built houses; there are, however, several fine public squares and a beautiful promenade along the river. It has an ancient cathedral and other churches, a medical college, an orphan asylum and foundling hospital, and manufactures of soap and earthenware. Pop. (1887), 9220.

**TUDOR**. See **BRITAIN** and the articles **HENRY VII.**, **HENRY VIII.**, **ELIZABETH**, &c.

**TUDOR STYLE**, in architecture, the latest Gothic style in England, forming a transition from the Perpendicular to the Elizabethan style. It is characterized by a flat arch, shallow mouldings, and a profusion of panelling on the walls.

**TUESDAY** (Latin, *dies Martis*), the third day of our week, so called from the Anglo-Saxon god of war, *Tiw* (whence the Anglo-Saxon *Tiwesdag*).

**TUFA**, or **TUFF**, the name of a soft porous stone, sometimes composed chiefly of calcareous matter deposited from water holding much carbonate of lime in solution, and sometimes of a fine volcanic powder, and cemented more or less completely by the percolation of water. The first kind, called calcareous tufa, when consolidated, becomes travertine; the second kind, called volcanic tufa, is the material in which Pompeii is buried. Under the microscope it has sometimes been found to contain organic remains.

**TUILERIES** (from *tuile*, a tile, because the spot on which it is built was formerly used for the manufacture of tiles), the residence of the French monarchs, on the right bank of the Seine, in Paris. Catharine de' Medici, wife of Henry II., began the building from the designs of Philibert Delorme and Jean Bullant (1564). Henry IV. extended it, and founded the old gallery (1600), which was intended to connect it with the Louvre, and form a residence for twenty-four artists. Louis XIV. enlarged it (1654), and completed that gallery. The side towards the Louvre consisted of five pavilions and four ranges of buildings; the other side had only three pavilions. In the pavilion of Flora Napoleon resided, and it was afterwards occupied by Louis XVIII. and his successors. During the revolution of 1830 the palace was sacked and the furniture destroyed by the mob. It was restored by Louis Philippe to its former splendour, but in 1848 the populace once more drove their sovereign from his residence, and wreaked their vengeance on the furnishings of the royal chambers. The Tuileries then became an hospital for wounded, a picture-gallery, and the home of Louis Napoleon in 1851. On the evening of the 23d May, 1871, this magnificent structure was almost totally destroyed by fire (the work of the communists), and the remaining portions were finally removed by order of the government in the course of the year 1883.

**TULA**, a government of Central Russia, with an area of 11,772 square miles. The surface is so generally flat as to have somewhat of a monotonous appearance. The principal rivers are the Oka, the Upa, and the Don. By canal there is water communication with the Baltic, the Black Sea, and the Caspian. Much grain is produced, and vast numbers of horses, cattle, and sheep are reared. Iron is smelted and manufactured to a large extent. Tula is the capital. Pop. (1897), 1,432,743.

**TULA**, a town of Russia, capital of the above government, on the Upa, 107 miles south of Moscow. Tula, with its numerous towers, domes, and spires, presents a very striking appearance, entitling it to be regarded as one of the handsomest provincial towns in Russia. It is the residence both of a civil and a military governor, the see of a bishop, and has manufactures of fire-arms and hardware so extensive as to have procured for it the name of the Russian Birmingham. The fire-arms of the government are manufactured in an extensive establishment. The other manufactures of importance here are cutlery, ornamental steel-work, platina snuff-boxes, silks, hats, soap, candles, cordage, and leather. Pop. (1897), 111,048.

**TULIP** (*Tulipa*), a genus of plants of the order Liliaceæ, natives of Europe, Western and Central Asia, and North Africa. They are bulbous plants, with leaves few, and disposed about the base of the stem; the latter simple, and usually terminated by a large solitary flower. The calyx is wanting; the corolla composed of six petals, and the stamens six in number. Among the garden species are *T. gesneriana*, introduced from the Levant in 1577, typically crimson-red with a blue base, from which most May-flowering and florists' or English tulips are derived; *T. suaveolens*, a South Russian species, introduced into Western Europe in 1603, with red and yellow flowers, the parent of the early-flowering Dutch tulips; *T. clusiana*, a Himalayan species, introduced in 1636, with red-striped white flowers, purplish in the centre; *T. platystigma*, an Alpine form from which the showy Dragon or Parrot Tulips are derived; and *T. sylvestris*, the wild yellow tulip of Britain. About a century after the introduction of the tulip into Holland a *tulipomania* prevailed there, and great sums were often given for a single bulb. It is still extensively cultivated in Holland, from which all Europe is supplied.

**TULIP-TREE** (*Liriodendron tulipifera*), a tree belonging to the natural order Magnoliaceæ, a native of North America, where it is sometimes called poplar, whitewood, &c. It is a beautiful tree, about 140 feet high and 8 or 9 feet in diameter in the Western States. The leaves are smooth, with two lateral lobes near the base, and two at the apex, which appears as if cut off abruptly by a broad shallow notch; petals long, greenish-yellow, marked with orange, in two rows, making a bell-shaped corolla; pistils flat and scale-formed, long and narrow, cohering together in an elongated cone, which, when mature, is 3 inches long. The tree is unknown in the wild state east of the Connecticut River, although occurring as far north as lat. 45°, at the southern extremity of Lake Champlain. It delights only in deep loamy soils, such as are found in the rich alluvial flats which lie along the rivers and on the borders of the great forest-swamps. In some parts of the Western States it constitutes, alone, pretty extensive tracts of the forest, and here attains its largest dimensions. The heart, or perfect wood, is yellow, approaching to a lemon colour, and the sap white. Though classed among the light woods, it is much heavier than the poplars; the grain is equally fine, and more compact; it is easily wrought, polishes well, and is sufficiently

strong and stiff for purposes requiring great solidity. Mechanics distinguish two varieties, the white and yellow, the latter of which is preferred. The wood is used for a great variety of purposes, such as trunks, bedsteads, bowls, cattle-troughs, &c. The bark, seeds, and cones are used in chronic rheumatism.

**TULLAMORE**, a town in King's County, Leinster, Ireland, on a tributary of the Clodagh, near the centre of the Bog of Allen, 48 miles w. by s. of Dublin. Owing to its central situation in a populous district, and its position on the Grand Canal and on a branch of the Great Southern and Western Railway, Tullamore is a thriving trading town. There are a Roman Catholic and some Protestant churches; a town-hall, jail, court-house, work-houses; a brewery, malting establishments, a distillery, aerated-water works, &c. Great quantities of corn and provisions are sent to Dublin. Pop. (1891), 4522; (1901), 4639.

**TULLE**, a town of France, capital of the department of Corrèze, on an acclivity at the confluence of the Corrèze and Solane, 115 miles N.N.E. of Bordeaux. It is an ancient place, and is generally composed of houses which are old and ugly, but some of which possess considerable interest from their antiquities. It has a cathedral and Episcopal palace, a communal college, a diocesan cemetery, court-house, theatre, &c. There are manufactures of firearms, made in a government factory; woollen goods, iron goods, paper, leather, &c.; and a trade in brandy, liqueurs, paper, wool, horses, &c. Pop. (1896), 17,374.

**TULLE**, a kind of silk open lace or net formerly manufactured at Tulle in France in narrow strips, and much used in ladies' caps, &c.

**TULLUS HOSTILIUS**, according to the common statement King of Rome and successor of Numa Pompilius (B.C. 672), a warlike monarch, in whose reign took place the combat of the Horatii and Curiatii. (See *HORATI*.) He subdued and utterly destroyed Alba by treachery. He likewise conquered the Fidenates and Sabines. His death, after a reign of thirty-three years, is ascribed by some to lightning, by others to Ancus Martius, his successor.

**TULLY**. See *CICERO*.

**TUMOUR**, a term applied in its widest sense to a swelling or enlargement in any part of the body, of any kind. More strictly, however, it implies a permanent swelling, occasioned by a new growth, and not a mere enlargement of a natural part, which is called hypertrophy. Tumours are divided into two great classes—solid and encysted, or, in other terms, simple or benign, and malignant or cancerous tumours. The solid tumour is generally enveloped in a dense cellular sheath formed by condensation of the cellular tissue during the enlargement of the new growth. This covering separates the diseased from the healthy parts. The cyst of encysted tumours, on the contrary, must be considered as an integral part of the tumour; for should one of these tumours be removed and any part of the cyst be left, the disease is certain to be reproduced. Generally speaking, tumours cannot be cured by external applications, such as liniments, friction; excision appears to be in most cases the only available remedy. See *CANCER*, *POLYPUS*, and *WEN*.

**TUMULI**, or **BARROWS**, artificial mounds of earth or stone raised to mark the resting-place of the dead. The practice of rearing sepulchral mounds may be traced in all countries to the remotest antiquity. Their origin is to be sought for in the heap of earth displaced by interment, which still to thousands suffices as the most touching memorial of their dead. In a rude age, when the tomb of the great warrior or patriarch was to be indicated by some more remarkable token, the increase of the

little mound by the joint labours of the tribe into the form of a gigantic tumulus would readily suggest itself as the fittest mark of distinction. The ancient Scythians had their barrows on the banks of the Borysthenes, the aborigines of North America on the banks of the Mississippi and the Ohio; the steppes of Tartary are thickly covered with barrows, and they have been found in Southern Africa and in the interior of New South Wales. They may still be seen in great numbers in Denmark, Germany, Sweden, France, Portugal, Spain, and the British Isles. Barrows differ considerably in form as in magnitude, and have been divided, according to their shape, into such classes as the long barrow, the bowl barrow, the bell barrow, &c. Among other tumuli in England may be mentioned Deverel Barrow, in Dorsetshire, on the downs to the west of Blandford, which on being explored in 1825 was found to contain twenty-one unbaked urns, with broken pottery and other remains, inclosed in a cist or stone coffin; and Bartlow Hills, in the county of Essex, on the southern body of Cambridgeshire, being the name given to four tumuli of varying size, arranged in a row, the largest of which, measuring 142 feet in diameter by 44 inches in height, was excavated in 1835, and a square inclosure or chest discovered containing various remains of Roman or British-Roman manufacture, such as glass urns or bottles, a bronze lamp and cup, glass vessels, an enamelled vase, &c. Among Scotch barrows, one of the most remarkable forms is the ship barrow, a specimen of which occurs in the parish of Dunning, Perthshire. It consists of an earthen mound covering several acres, and resembling a ship turned upside down. The most numerous and remarkable, however, of the Scottish sepulchral mounds, both for number and size, are the stone tumuli or cairns. See *Greenwell's British Barrows and Sepulchral Mounds*; *Wilson's Pre-Historic Annals of Scotland*; *Anderson's Scotland in Pagan Times*; &c.

**TUN**, the name originally applied to all large casks or similar vessels for containing liquids. In several countries the name, or rather one derived from the same root, came to denote a measure of capacity, and *ton* is etymologically the same word. The tun in old English wine-measure contained 252 gallons, or 4 hogsheads; but measures of higher denomination than a gallon are no longer legally recognized.

**TUNBRIDGE**, or **TONBRIDGE**, a town of England, in the county of Kent, about 4 miles north of Tunbridge Wells, on an acclivity above the Medway, here crossed by several bridges, 11 miles south-west of Maidstone. It consists chiefly of a long and tolerably well-built street; and has a handsome church with a square embattled tower, several Dissenting chapels, a well-endowed grammar-school, a new public hall and market-house, a free library, &c. It has manufactures of gunpowder and fancy wooden wares (Tunbridge ware). Pop. (1891), 10,123; (1901), 12,736.

**TUNBRIDGE WELLS**, a municipal borough, market-town, and watering-place of England, in Kent, pleasantly situated amid picturesque scenery, about 28 miles S.E. of London, and 4 south of Tunbridge. It consists chiefly of clusters of houses many of them handsomely built on detached eminences; and of a spacious parade, finely planted on one side, and occupied by assembly-rooms, libraries, and elegant shops on the other; and has numerous places of worship and schools, a commodious town-hall, corn exchange, public hall, the Pump Room and Nevill's Club, Convalescent Home for children, mechanics' institute, an infirmary and dispensary; and an extensive sale of fancy articles

in inlaid wood, such as ladies' work-boxes, desks, &c., covered with mosaic work forming pretty pictures, and known by the name of Tunbridge ware. The spring to which the place owes its origin and prosperity is chalybeate, and is considered very efficacious in cases of weak digestion. The wells are situated on the promenade called The Pantiles, and the accommodation provided for the numerous annual visitors is ample. Pop. (1891), 27,895; (1901), 33,388.

**TUNDRA**, the Russian name for the extensive low-lying, swampy peat-mosses which compose a considerable part of the great Siberian plain, and that of N. Russia. From June till the middle of August the tundras are thawed to a small depth, and are seen covered with mosses and lichens, among which there are sprinkled a few flowering plants. Many furred animals, along with various migratory birds, resort hither for the short summer season.

**TUNE**. See **MELODY**.

**TUNGSTEN**, a metal occurring in the minerals Wolfram (tungstate of iron and manganese), scheelite (tungstate of calcium), and scheelite (tungstate of lead). These minerals are found in Cornwall, in Saxony, in Bohemia, and in Chili. Metallic tungsten may be prepared by heating the trioxide in a stream of hydrogen; it is a granular powder of a light-gray colour and strong lustre, having a specific gravity of about 19. When heated in air tungsten burns to the oxide. Tungsten has the symbol W (from the German Wolfram) and the atomic weight 184. This metal forms four chlorides— $WCl_2$ ,  $WCl_3$ ,  $WCl_4$ , and  $WCl_5$ ; it also forms two oxides,  $WO_2$  and  $WO_3$ . The latter of these is soluble in aqueous alkalis; on acidulating this solution with an acid a hydrated oxide ( $H_2O \cdot WO_3$  or  $H_2 \cdot WO_3$ ) is precipitated. This hydrate is possessed of acid properties, and forms a series of salts called *tungstates*. Various other salts of tungsten are known.

**TUNICATA**, a class of Mollusca or Lower Mollusca (see **MOLLUSCA**), including those forms known as Sea-squirrels (which see) or Ascidians, Salpæ (which see), Pyrosomæ (which see), and others.

**TUNING-FORK**, a forked piece of steel constructed and tempered so as to give a definite musical note when caused to vibrate. For musical purposes tuning-forks are small and easily carried in the pocket. They may be caused to sound by striking against the knee; the sound will be much strengthened by placing the handle in contact with a table. Large tuning-forks are used for lectures on acoustics, fixed on sounding-boxes, and caused to vibrate with a rosined hair-strung bow. See **PITCH**.

**TUNIS**, a country of North Africa, formerly dependent on Turkey, now a French protectorate, is bounded on the north and north-east by the Mediterranean, on the south-east by Tripoli, and on the west and south-west by Algeria; area, estimated at 45,700 square miles. The coast-line presents three remarkable indentations, forming the Bay of Tunis on the north and those of Hammamet and Cades or the Lesser Syrtis on the east. The north-west portion of Tunis, lying between the frontiers of Algeria on the west and the valley of the Mejerdah on the south and east, is traversed by a range of mountains which, entering from the west, spread over the whole district. These mountains, estimated at nearly 4000 feet high, are well covered with fine timber, and on their lower slopes have many fertile tracts, partly under culture and partly under olive plantations. The valley of the Mejerdah itself is a fertile tract, through which now runs the railway from Algiers to Tunis. A similar mountainous region lies to the south-east of the Mejerdah valley, and south of this again stretches the extensive plain

or plateau of Kairwan. The fertility of this part of the country was celebrated by the ancients, but at present in great part it is little better than a desert, though the numerous ruins to be met with testify to its former populousness. The only river of any consequence in Tunis is the Mejerdah. Agriculture is very much neglected, and large tracts, capable of yielding productive returns, remain in a state of nature. The principal crops are wheat, barley, and maize; olives also are extensively grown, and date plantations are so numerous as to furnish the principal subsistence to many of the inhabitants. Tobacco, cotton, indigo, saffron, and opium are also grown. Considerable areas are covered with esparto. Almost all the fruits of Southern Europe abound, and in various quarters drugs and dyes form special objects of culture. The principal domestic animals are mules, oxen, and camels. On several parts of the coast the fisheries, including that of coral, are valuable. The manufactures consist chiefly of woollen fabrics, more especially the red caps known all over the Mediterranean; soap, dyed skins, and ordinary and morocco leather. The trade with the interior and with Europe is of considerable extent. The chief towns are Tunis (the capital), Sfax, Susa, and Kairwan. Olive and other oils, cereals, ores and metals, animals and animal products, fruits and seeds, sponges, esparto grass, &c., are exported; value in 1900, £1,700,000. The inhabitants consist of Moors and Arabs, with Berbers, here called Kroumirs, occupying the elevated tract north of the valley of the Mejerdah, Turks and Jews, and a few Christians. The native ruler has the title of *bey*. In ancient times Tunis belonged to the Carthaginians, and afterwards formed part of the Roman province of Africa. About 675 it was subdued by the Arabs, who established a viceroyalty at Kairwan. In the thirteenth century Tunis became a powerful state under independent rulers. About 1575 it was incorporated with the Ottoman Empire. Till the capture of Algiers in 1816 Tunis was, along with Algiers, a mere nest of pirates. In the spring of 1881 the French invaded Tunis, in order, as they alleged, to punish the turbulence of the Kroumirs, who harassed the frontiers of Algeria; and as the result of this invasion, the bey was obliged to agree to a convention which has made the country a French protectorate under a resident, the bey's authority being now only nominal. The bulk of the commerce passes through Goletta (the port of Tunis). The chief exports to Great Britain are esparto grass, zinc ore, and phosphate of lime, while the principal imports consist of cotton fabrics and coal. Pop. 1,900,000.

**TUNIS**, the capital of the above state, lies on the Mediterranean, at the western extremity of a shallow salt lagoon connected with the Bay of Tunis by a narrow channel at the port of Goletta. A canal, 7 miles long and 22 feet deep, has been dredged through this lagoon to Tunis. The interior of Tunis presents generally a labyrinth of narrow dirty streets; but great changes have taken place since the French occupation, a European quarter with fine buildings (including the French residency, the public offices, R. Catholic cathedral, &c.) having arisen. Among the most interesting native buildings are the bey's palace and the mosques. There is now regular steam communication with Europe and the ports of Algeria, and a railway runs to Algiers. The ruins of ancient Carthage lie about 10 miles to the north-east of Tunis, and may be reached by railway. Pop. estimated at 170,000.

**TUNNEL**, a subterranean passage to carry a canal, road, or railway. Tunnels are always arched above and more or less curved at the sides so as to resist the downward and inward pressure. Where the sole

is of firm rock it requires no masonry or brickwork to strengthen it, but where the material is soft an inverted arch must be constructed between the side walls to resist the upward pressure. A tunnel is always constructed from both ends at once, and sometimes when it is long it is begun at various points by sinking shafts at intervals from the surface of the ground to the depth of the tunnel and proceeding with the excavation in both directions from the bottom of the shafts. In excavating a tunnel from various starting-points in this way it is a common practice to begin by working a smaller passage of about 6 or 7 feet in height from shaft to shaft through the whole length of the tunnel, with its summit on a level with that of the tunnel. By this method the centre line of the tunnel is fixed, and the excavation proceeds by the enlargement of this smaller passage. As the work goes on the sides of the tunnel are supported by boards and bars, and when a certain length has been completed a centering is constructed, as in building arched bridges (see BRIDGE), and the roof and sides are then built up with stone or brickwork. When a tunnel is very long permanent shafts are constructed for ventilation. These are generally made circular in section and about 10 feet in diameter. Service shafts are made only wide enough to allow the buckets used to convey away the excavated materials to pass one another, and are built up when the tunnel is completed. The greatest completed work in tunnelling is the railway tunnel through the St. Gothard group, the boring of which was finished on the 29th of February, 1880; but the largest in the world will be the Simplon tunnel, from Brieg to Iselle, which was begun in 1898 and may be finished in 1904. A project to tunnel under the Straits of Dover has been refused the sanction of the British government. See CENTS. GOTHARD, SIMPLON.

**TUNNY** (*Oreynus Thynnus*), a genus of Teleostean fishes, belonging to the Acanthopterus division of the order, and included in the Scomberidæ or Mackerel-family. The genus is distinguished by possessing from six to nine finlets or divisions of the dorsal fin; by the scales of the breast forming a kind of 'corselet;' by the tail being keeled or ridged on each side; and by having teeth on the vomer and palate. The colours are brilliant, but not much varied: the back resembles polished steel, being coloured dark blue; the under parts are silvery; and all the fins are yellow except the first dorsal. These fish live in shoals in almost all the seas of the warmer and temperate parts of Europe, Asia, Africa, and America, but are not equally common in every season or in all parts of the seas which they frequent. Immense numbers enter the Mediterranean by the Straits of Gibraltar in May and June, and immediately divide, one part following the shores of Europe and the other those of Africa, in search of a place to deposit their spawn. They penetrate into the Black Sea; and it is remarkable that they follow the right shore of the Bosphorus in going, and the left in returning—a circumstance which induced some of the ancients to suppose that they saw more clearly with the right eye than the other. At the approach of winter they retire to deep water. They often, besides, undertake irregular migrations. They have been known to accompany vessels sailing from Europe to America for more than forty days. The tunny is very voracious, and consumes a great quantity of food. Its animosity against the mackerel is well known: it is sufficient to present a rough image of this fish to draw it within the nets. It is taken in immense quantities in large seine-nets. The flesh somewhat resembles veal, is delicate, and has been in request from time immemorial. It forms an extensive branch of commerce in the Mediterranean,

and not less than 45,000 are taken annually on the coasts of Sardinia alone. Stations have been established in elevated places for watching the approach of the tunny, from the most remote antiquity. This fish rarely visits the northern coasts of Europe in shoals, though solitary individuals are not unfrequent. (See ICHTHYOLOGY, Plate II.) A second species is the Pacific Albacore (*Oreynus Pacificus*), which follows ships in large numbers and for great distances.

**TUNSTALL**, a town in England, Staffordshire, 2½ miles N.E. of Newcastle-under-Lyme. It has rapidly risen from a hamlet to a considerable town, and has a spacious market-place, with a town-hall in its centre; a Victoria institute, containing a library and schools of art and science; a fine market-hall; and a memorial clock-tower. Manufactures of china and earthenware, bricks and tiles, &c., are carried on. Coal and ironstone are worked, and iron is manufactured in the town. Pop. of township (1891), 15,730; (1901), 19,492.

**TUPELO** (*Nyssa*), a genus of forest-trees peculiar to North America, and almost strictly confined within the territory of the United States. The leaves are simple, alternate, and mostly entire; the flowers greenish and inconspicuous, disposed at the extremity of a long peduncle; the fruit is a drupe, containing a hard stone. The flowers are dioecious. The genus *Nyssa* includes several species and belongs to the natural order Cornaceæ.

**TURANIAN**. See URAL-ALTAIC.

**TURBAN** (in Turkish, *dulbend*, *tulbend*), a covering of the head, worn by most nations in the East, and of very various forms in different nations and different classes in the same nation. It consists of a piece of cloth wound round a cap. The Turkish sultan's turban contains three heron's feathers, with many diamonds and other precious stones. A particular officer, *tulbend aga*, takes care of it. The grand vizier has two heron's feathers; other officers but one. The emirs, as descendants of Mohammed and Fatima, have the privilege of wearing a green turban.

**TURBELLARIA**, an order of Scolecida (which see), included in the division of the Platyelmia or Flat-worms, but distinguished from the Tape-worms and Flukes by the fact that its members are not parasitic, and are for the most part aquatic in habits. The Turbellarians possess ciliated outer surfaces, but do not possess suckers or hooklets. The alimentary canal may be straight or branched, and an anal aperture may or may not be present. Two groups—the Planarida and Nemertida—are included in this order; the former being represented by certain fresh water and marine forms, and the latter by the Nemertes (which see) or Ribbon-worms.

**TURBINE**, a term formerly confined to horizontal water-wheels, the revolution of which is due to the pressure derived from falling water, but now applied to any wheel driven by water escaping through small orifices subject to such pressure. The name is originally French, and is derived from the Latin *turbo*, a whipping-top, from the similarity of the motion. The horizontal turbines are much the commonest. The simplest form of the machine is what is called the Scotch turbine, or the reaction wheel, a development of Barker's mill, described in the article HYDRAULICS. The first considerable improvement in turbines was made by Fourneyron, who in 1827 constructed a machine of this kind on a principle suggested by Euler, by which the force of the water is more completely utilized. In this machine the water is supplied, as in Barker's mill and the Scotch turbine, by a vertical pipe, but instead of at once escaping through radial arms, it first passes over a fixed plate through a number of channels curved in



such a manner as to give the water on leaving these channels a direction tangential to the circumference of the plate. From these channels the water passes into similar channels in the revolving wheel curved in the opposite direction, and finally escapes at the circumference of the wheel. Other forms of horizontal turbines have been invented by Henschel, Jorval, Fontaine, Nagel, Whitelaw, and others. Those in which the water is supplied at the centre and flows outwards, as in Fourneyron's machine, are called outward-flow turbines, and those in which the water is supplied at the circumference, and escapes by an orifice at the centre, are called inward-flow turbines. The high and low pressure vortex-wheels invented by Mr. Thomson of Belfast (late Professor Thomson of Glasgow) are among the best examples of the latter class. Turbines are much smaller than ordinary water-wheels, but revolve much more quickly. Where the fall of water is small they yield a better, but where it is great, a worse result than the other wheels. Where, however, the fall is more than 40 feet, ordinary water-wheels cannot as a rule be conveniently used, while turbines can be used for falls of several hundred feet. Turbines are therefore best adapted for small and very great falls, and the ordinary water-wheels for moderate falls of water. See further details under **HYDRAULICS**, and for steam turbines see **SUPP.**

**TURBOT** (*Rhombus maximus*), a well-known species of Flat-fishes or Pleuronectidae (which see), sometimes attaining a weight of 70 lbs., and plentifully found off the coasts of Britain. The colour is brown on the left side, which is usually the upper side, or that on which the eyes are placed through the twisting of the bones of the head. These fishes are caught by the line or trawl-net, and their food consists of molluscs, crustaceans, and the smaller fishes. The flesh is highly esteemed. See the illustration at **ICHTHYOLOGY**, Plate II.

**TURCOMANS.** See **TURKESMAN**.

**TURENNE**, HENRI DE LA TOUR D'AUVERGNE, VICOMTE DE, a renowned French commander, born in 1611 at Sedan, was the second son of Henri de la Tour d'Auvergne, duke of Bouillon, and of Elizabeth, daughter of William I., prince of Orange. He learned the art of war under his uncles Maurice and Henry of Nassau, and in 1630 entered the service of France. In this service he distinguished himself in Lorraine and Northern Italy, and in December, 1643, he received from Mazarin the command of the army of the Rhine, the remains of the army of Bernhard of Weimar. (See **THIRTY YEARS' WAR**.) During the campaigns of 1644 and 1645 he kept in check the imperial forces under Mercy. In August, 1646, he succeeded, by a series of skilful manœuvres, in forming a union with the Swedes under Wrangel, and along with him defeated the Bavarians at Zusmarshausen, and compelled the elector to agree to a truce (March, 1647). Subsequent successes of his contributed greatly to hasten the conclusion of the Peace of Westphalia (1648). During the disturbances of the Fronde, which began in the same year in which this peace was concluded, he at first sided with the malcontents in order to please the Duchess of Longueville, and to follow the example of his elder brother; but after the death of the latter he changed sides, and defended the court against the Prince of Condé, who had previously been the main support of the court party. The victories of Turenne at Blénac on the Loire (April, 1652), and in the suburb of St. Antoine at Paris (July, 1652), led to the termination of the civil war and the complete triumph of the court party; but during these disturbances the Spaniards had taken up arms, and now under Condé, who was so exasperated with the court that he joined

the enemies of France, invaded Artois. Turenne was sent to repel the invasion, and gained a victory at Arras in 1654. But the war was prolonged for several years. At last his victory on the downs near Dunkirk in 1658, and the capture of Dunkirk itself in the same year, prepared the way for the Peace of the Pyrenees, which was concluded in the following year. In 1660 he was named marshal-general of the camps and armies of France. When the war was renewed with Spain in 1667 Turenne conquered Flanders in three months, and in the following year subjugated Franche-Comté in as many weeks. In the Dutch war of 1672 he had the chief command, and earned greater renown by his exploits during this war than in any other. The United Provinces had obtained as allies the Elector Frederick William of Brandenburg and the German Empire. Turenne first marched against the elector, and having driven him back as far as the Elbe forced him to sign the Treaty of Vossem in 1673. In the winter campaign of 1674-75, which was signalized by the victories of Sintzheim, Mulhouse (1674), and Turkheim (1675), he delivered Alsace, which had been given up for lost by the ministers of Louis XIV., from the imperial troops. This is the most brilliant campaign of his whole career. At the conclusion of it he was invited by Louis to hasten to the court to receive the monarch's personal thanks for his achievements, and his journey to the palace of St. Germain was a continued triumph. In the summer of 1675 he returned to his army on the Rhine, but on the 27th of July was killed at Salzbach while making his preparations to engage Montecuculi. Turenne was a man of great modesty and disinterestedness. He was by education a Protestant, and remained attached to that faith most of his life, but in 1668 went over to Catholicism. Bossuet, who wrote for him his *Exposition de la foi*, is usually credited with his conversion. His life has been written by Sandras, Raguenet, and Ramsay, and the last-mentioned published his *Memoirs of his Campaigns* from 1643 to 1658.

**TURGOT**, ANNE ROBERT JACQUES, a patriotic and enlightened French minister, was born at Paris in 1727, and in his youth gave himself up to the study of theology at the Sorbonne. In 1751 he renounced his intention of entering the church, and in the end of the following year he was admitted a councillor of the parliament. While fulfilling the duties of this position he also occupied himself with economical studies, and made himself well acquainted with the physiocratic system of Quesnay. In 1761 he was appointed intendant of Limoges, which post he occupied for twelve years, and was long remembered with gratitude for his wise, salutary, and benevolent reforms and regulations. On the accession of Louis XVI. in 1774 Turgot was pointed out by the reform party as the man who might perhaps save the state; but the first minister, Maurepas, and the adherents of the old system were afraid to commit the management of the finances to a man who passed for a philosophical reformer, and he was accordingly only put at the head of the marine; but in the same year (August, 1774) he became comptroller-general of France. He now had a wider sphere for carrying out his principles. He moderated the duties on articles of the first necessity without loss to the revenue; freed commerce from many fetters, and encouraged industry by enlarging the rights of individuals, and abolishing the exclusive privileges of companies and corporations. He also formed a project for commuting the feudal rights, for rendering salt an article of free merchandise, and for reforming the royal household. His reward for these useful and benevolent views was opposition and



ridicule. He was, however, able to carry into effect some very important improvements; but as he endeavoured to control the nobility, restrict the clergy, and restrain the license assumed by the officers of the crown, they all united against him. The result was his dismissal from office in 1776, from which period he lived a retired and studious life until his death at Paris in 1781.

**TURIN** (Italian, *Torino*), the fourth largest city of Italy, capital of the province of the same name in Piedmont, situated mainly on a fertile plain on the left (west) bank of the river Po and chiefly to the south of the Dora Riparia, which joins the Po below the town, 75 miles w.s.w. of Milan. Both rivers are crossed by several bridges. The streets are regularly laid out, and several of them are lined by arcades with shops. The chief square of the city is the Piazza Castello, with the Palazzo Madama in the centre, a somewhat heavy-looking thirteenth-century structure now containing several institutions; and among the numerous other squares are the following: Piazza San Carlo, with Marocchetti's equestrian statue of Duke Emanuel Philibert; Piazza Vittorio Emanuele, a large square with a marble statue of Victor Emanuel I.; Piazza Carlo Alberto, with an equestrian statue by Marocchetti of Charles Albert; Piazza Carlo Emanuele II., or Carlina, with the fine Cavour monument by Dupré; Piazza dello Statuto, with a colossal monument to commemorate the cutting of the Mont Cenis tunnel; and the Piazza Lagrange, with a marble statue of the great mathematician. The chief public gardens are the Nuovo Giardino Pubblico, on the river side, continued south by the botanical garden; the Giardino della Cittadella; and the Giardino Reale and zoological garden. The most conspicuous church is the cathedral dedicated to St. John Baptist, built in Renaissance style in 1492-98, with a marble façade, and containing the burial-chapel of the Dukes of Savoy. Other churches are those of La Consolata, constructed in baroque style in 1679, containing a much-prized madonna; San Spirito, a seventeenth-century building; S. Massimo, built 1845-54, with a dome, and containing good frescoes and statues; and Gran Madre di Dio, a domed building erected in 1818 in imitation of the Roman Pantheon. There is also a synagogue in Moorish style, and a Waldensian church. Of public buildings and institutions the following are the most noteworthy: Palazzo Madama, already mentioned; Palazzo Carignano, a seventeenth-century structure, the seat of the Italian parliament in 1860-65, now containing natural history collections; Palazzo di Città, or town-hall, built in 1659, containing a library and several monuments; Palazzo Reale, or royal palace, a plain brick building begun in 1660, with a royal armoury; Palazzo delle Torri, either a Roman gateway with two mediæval towers or an eighth-century Lombard building, now used as a drawing-school; Palazzo dell' Accademia delle Scienze, with good collections of Egyptian, Greek, and Roman antiquities, and a picture-gallery; Accademia Albertina delle Belle Arti; Mole Antonelliana, begun as a synagogue in 1863 and completed in 1878-89 as a historical national museum; Museo Civico, with a varied collection; the arsenal, containing an artillery museum; an industrial museum; the exchange; the university, founded in 1404, in present building since 1713, with a museum of antiquities, library, &c.; a military academy; a polytechnic school, in an old royal palace; several fine theatres; several hospitals, and other benevolent institutions; and the large central prison. The manufactures are extensive and include silk, jewellery, furniture, pianofortes, chocolate, beer, gloves, leather goods, paper, soap, sugar, tobacco, machinery, &c.—

Turin was anciently the capital of a tribe called the Taurini, and under the Roman Empire was called Augusta Taurinorum, having been colonized by Augustus. Charlemagne made it the residence of the Duke of Susa, whose line reigned till 1032, when it was succeeded by that of Savoy. It was the capital of the modern Kingdom of Italy from its formation till the removal of the seat of government to Florence in 1865. Turin was taken by the French in 1640, and unsuccessfully besieged by them in 1706. Pop. (1901), 335,639.

**TURKESTAN**, a name which in the widest sense denotes the vast territory extending eastwards from the Caspian Sea to the Desert of Gobi, and southwards from Siberia to Persia, Afghanistan, India, and Tibet. It embraces two main sections, both naturally and politically distinct, namely Eastern or Chinese Turkestan, and Western or Russian Turkestan. The former is bounded on the west by the mountainous plateau of the Pamir; on the north by the Thian-Shan mountains; on the south by the Kuen-Lun and Altyn-Tagh ranges, separating it from Tibet; and on the west by the Desert of Gobi. It consists practically of the basin of the Tarim river, which flows eastwards and loses itself in Lob-Nor. Three-fourths of the country are desert, but the remainder yields many valuable products, the chief towns being Kashgar and Yarkand. Western Turkestan includes, besides the Russian general government of Turkestan, the general government of the Steppes, the governments of Turgai and Uralsk, the Transcaspian territory, and the vassal khanates of Khiva and Bokhara. The total area of Eastern and Western Turkestan is about 1,880,000 square miles, with a population of 11,600,000. The area of Western Turkestan is 1,444,000 square miles, and the population about 11,000,000. The general government of Turkestan, comprising the governments of Samarkand, Ferghana, and Syr-Daria, has an area of 207,134 square miles and a pop. (1897) of 3,898,076. In the east and south-east Russian Turkestan is mountainous, with fertile valleys; but the greater part of the region belongs to the dreary, sandy plains of the Aralo-Caspian depression, often salt-encrusted, and only at isolated oases, or where irrigation has been successfully introduced, yielding crops of any kind. Its two largest rivers, the Oxus or Amu-Daria and the Jaxartes or Syr-Daria, rise in the southern highlands and flow into the Aral Sea, inclosing between them the sandy desert known as Kizil Kum. The Ili river similarly loses itself in Lake Balkhash; but the other streams, notably the Zarafshan of Samarkand, and the Murghab of the Merv oasis, simply dry up in the sands. Of the lakes, those above-named and Issik-Kul and Kara-Kul are the most noteworthy. The climate is continental, extreme heat being followed by extreme cold, and the rainfall is exceedingly scanty. The cultivated plants include wheat, barley, rice, cotton, hemp, madder, flax, tobacco, many fruits, mulberry, maize, and sorghum. Horses, cattle, sheep, and camels are reared in large numbers. The inhabitants comprise, besides Russians and other settlers, Usbeks, Kirghizes, Turkomans, Tajiks, Persians, &c., and many of them lead a nomadic life. Tashkent is the political capital of Turkestan proper. The Transcaspian railway has done much to open up the country, which now exports large quantities of raw cotton. Valuable minerals exist. Russia acquired Western Turkestan in the last century, mainly after 1850. Eastern Turkestan has long belonged to China, but between 1864 and 1877 it was independent.

**TURKEY.** A sketch of the history of the Turks and the Turkish dominion will be found under OTTO-

**MAN EMPIRE**, and geographical and statistical notices of the parts of that empire that lie out of Europe, as enumerated at the beginning of that article, under their several headings. It thus remains for us here only to give a geographical and statistical account of Turkey in Europe; to which we prefix a statement of the area and population of the whole empire, the figures being taken from *Die Bevölkerung der Erde*, by Dr. A. Supan (Gotha, 1899), and the *Almanach de Gotha* (1902):—

EUROPE:—		
	Area in sq. miles.	Population.
Immediate possessions, ..	64,582	5,891,700
Bulgaria (vassal state), ..	24,380	2,641,385
Eastern Rumelia (practically part of Bulgaria) ..	12,931	1,091,854
Crete (autonomous) .....	3,327	309,349
Bosnia and Herzegovina (In Austrian occupation) .....	19,728	1,591,036
Thasos (Egyptian), .....	152	12,140
	125,100	11,537,414
ASIA:—		
Immediate possessions, ..	681,985	16,898,700
Samos (principality), ....	181	54,834
	682,166	16,953,534
AFRICA:—		
Egypt (practically British), ..	883,800	9,821,045
Tripoli and Benghazi, ....	398,802	1,000,000
	782,602	10,821,045
Total, .....	1,569,958	39,311,993

The Treaty of Berlin in 1878 greatly reduced the area under direct Turkish rule (see **OTTOMAN EMPIRE**), and since then Thessaly has been ceded to Greece, and Tunis has become a French protectorate, while Crete has been made autonomous.

European Turkey is traversed in different directions by numerous mountain chains, but three main systems may be distinguished. The first of these is the Hemus or Balkan range, stretching from west to east from the valley of the Timok on the borders of Bulgaria and Servia, to Cape Eminch on the Black Sea. The second of these systems is called in a loose way the Pindus range, and runs from north to south, starting from the Shardagh at the sources of the Vardar. It forms the watershed between the Ægean Sea in the east, and the Ionian and Adriatic Seas in the west, and separates Thessaly from Epirus, Macedonia from Albania. The third great mountain system starts from the same nucleus as the Pindus, and proceeds north-westwards under various names into Bosnia and Herzegovina, which are covered with the ranges belonging to it. In addition to these main systems there are several smaller chains and groups, such as the Acroceraunian or Chika mountains in the west, and the group to which Olympus belongs, in the east, and there are numerous offshoots from the three main systems themselves. The most important river basin of Turkey is that which drains into the Archipelago or Ægean Sea, which receives the Indje, Karasu, Vardar and Struma (Strymon) from Macedonia, and the Maritza, the ancient Hebrus, from Thrace. The Adriatic and Ionian Seas receive from Turkey no rivers worthy of notice, except the comparatively insignificant Albanian Drin, Scombi, and Vogatza. The Sea of Marmora receives only a few mountain torrents. Considering the mountainous character of the country, and its numerous perennial streams fed from snowy heights, it is remarkable that it does not possess a single lake worthy of the name, with the exception perhaps of those of Ochrida in the east, and of Scutari in the north-west of Albania. The principal plains of Turkey, which are remarkable for their fertility and beauty, occur in the south of Macedonia and the south-west of Albania.

Owing partly to the elevation of the surface, and

partly to its exposure to the north-eastern blasts from the interior of Russia, the climate is not so mild as the latitude might seem to indicate, and is, moreover, subject to sudden and violent fluctuations. The winter is very severe; on the other hand, the summer heat is excessive, especially in Albania and other districts which possess a shelter on the north, and even in the more exposed districts the vintage becomes general before the end of July. For the production of the ordinary cereals no part of the world is more admirably adapted; and the grain produced at present very fully indicates the immense quantities that might be produced under a better system of cultivation. The principal grains grown are maize, wheat, and barley. In various districts rice, millet, and buckwheat are also produced. Bad as the agriculture is, the produce of these cereals is not only amply sufficient for the home consumption, but yields considerable quantities for exportation. The cultivation of tobacco is very general, and in many parts is a great source of wealth. It has its principal seats in the vilayets of Saloniki and Yennina, that is, in portions of the ancient Macedonia and Epirus, where also the cotton-plant is cultivated. Flax, hemp, sesame, and madder are also grown in large quantities. Among the fruits of Turkey the figs are highly esteemed. The cultivation of the olive is carried on along the coasts of the Archipelago and the Adriatic, as well as on the island of Crete, and in these parts is one of the most important branches of agriculture. Wine is an important product in many districts, and much attention is paid, especially in Thrace, to the growing of roses, for the extraction of otto. Considerable quantities of opium are grown and exported. In connection with agricultural products may also be mentioned the breeding of oxen and the rearing of bees and silk-worms.

Manufactures now occupy a very secondary place in Turkey. There are scarcely any large manufacturing except in Constantinople. Elsewhere manufactures are either a domestic employment or are subsidiary to agriculture. It follows from this that the exports of Turkey are chiefly agricultural produce of one kind or another; while the imports are cotton, woollen, and silk goods, metals, iron, steel, and glass wares, and various other manufactured articles. No official returns of the commerce of Turkey are issued. The following table shows the value of the trade between the immediate possessions of Turkey in Europe and the United Kingdom in several years between 1880 and 1901:—

Year.	Exports from Turkey.	Imports.
1880, .....	£1,504,155	£3,968,671
1889, .....	1,459,321	3,493,403
1894, .....	1,012,252	3,331,024
1895, .....	1,352,385	3,015,854
1901, .....	1,382,700	2,823,435

In 1901 the exports from Asiatic Turkey to Britain amounted to £4,325,077, the imports from Britain to £4,253,083. The commerce centres at Constantinople. The principal railways are those from Constantinople and Salonica, which cities are now directly connected by railway with the rest of Europe. The length of telegraph lines is about 23,500 miles.

Accounts are usually kept in piastres, the value of which is about 2½d. sterling, 112 piastres being about equal to an English sovereign. A hundred piastres make a Turkish lira or gold medjidie (slightly more than 18s. in value), and 500 make a 'purse'. The metric system of weights and measures was introduced in 1882, the old names being applied to the metric units. Since 1889 it has been compulsory for measures of capacity, and since 1892 for weights. The units are: the *arshin* or metre; the *mill* or kilometre; the *farsang* of 10 miles; the *dunum*

or are (2·47 acres); the *djerib* or hectare; the *sultchak* or litre; the *kile* or hectolitre (also decalitre); the *oke* or kilogramme; the *deuk* or gramme; the *drachma* or decagramme; the *kantar* of 100 kilos.

The inhabitants, consisting of various races accidentally brought into juxtaposition or political relationship by immigration and conquest, present none of the kindred features which combine to form a national character. First in order are the Osmanli Turks, who, as the dominant race, are diffused over the country, but are most numerous in the south-east. By right of conquest they are proprietors of the greater part of the soil, and fill all the civil and military offices. They live generally in towns employed in various trades, and are never found as agriculturists, except in districts where they have settled in great numbers. Accustomed to obtain their wives and supply their harems from other races, they now constitute a very heterogeneous mixture, retaining few of the leading features of their ancient national character, though the masses are still distinguished by fanaticism, ferocity when roused, and Asiatic indolence, as well as by a certain degree of good-nature, frankness, and hospitality. Their highest enjoyment is to allow the time to pass indolently and luxuriously away, and their great places of resort are baths and coffee-rooms. The former are used universally by both sexes and all classes; the latter, placed often in the vicinity of natural or artificial fountains, shaded by trees and open to the sky, may be seen crowded at all times by visitors, in all forms of listless attitudes, apparently enjoying the highest happiness of which their nature seems capable, from such simple indulgences as a cup of coffee or a tobacco or opium pipe. The only striking contrast to such phlegmatic manifestations is presented by the general fondness for children, and the strong attachment of children to their parents, both of which affections are exemplified in numerous ways. The Greeks form the bulk of the population in Macedonia, Epirus, and the islands, and constitute to a very considerable extent the mercantile and trading community of Turkey, more especially in the seaports. Arnauts (as they are called by the Turks), or Skipetars, that is, mountaineers (as they are called by themselves), are found throughout Albania, but considerably mixed in the south with Greeks. Other races represented to a greater or less extent are Roumanians, Magyars or Hungarians, Gipsies, and Jews. The north-west (the former vilayet of Bosnia and northern Macedonia) is occupied by Servians; and Bulgarians inhabit the district south of the Danube and east of Servia and Albania. After the conquest of Circassia by the Russians large numbers of Circassians left their own land and found a refuge in Turkey, chiefly in Bulgaria and Thessaly. Armenians are found as traders in all the larger towns.

The government of Turkey is despotic. The monarch, usually designated by the titles of sultan, grand-seignior, or padishah, is regarded by the Turks as the khalif or head of Islam, and is addressed by European courts as majesty or highness. His edicts bear the name of batti-sherif, and his government is often designated as the Sublime Porte. The sovereignty is hereditary in the family of Osman, the presumptive heir being the eldest son who is born to the sultan after his accession to the throne. On a new succession the sultan is not crowned, but is girded with the sword of Osman in the Mosque of Eyub at Constantinople, after swearing to defend Islam. His dignity is conceived to be too transcendent to allow him to enter into the married relation, and he has therefore no proper wives. Among the females of his harem, however, there is a gradation

of rank. From four to seven, bearing the title of *kadin*, take precedence of all the others, while a still higher place and influence are assigned both to the mother of the sultan and to the mother of his presumptive heir.

The public officers who conduct the administration under the sultan are divided into three classes. The first class is that of law, which, being founded entirely on the Koran, makes no distinction between religious and civil, and, accordingly, includes all persons who discharge either ecclesiastical or judicial functions. At their head is the Sheikh-ul-Islam. The second class consists of the officials of the pen or the members of administration, properly so called. At their head is the grand-vizier or Sadr-azam, who is regarded as the centre of all administrative functions, domestic and foreign. The third class includes all the officials of the sword, or those who preside over the army and navy, the head of the former being the Seraskier or minister of war, and of the latter the Capudan Pasha or high-admiral, and minister of marine. Mufti is the title of the legal members of the councils of war, marine, police, &c., as well of the councils of provinces, districts, and towns. All magistrates and officers of chancery bear the title of effendi. Superior officers and sons of pashas have the honorary title of bey. Lower grades of officials bear the title of aga. The supreme deliberative council is the divan or privy council, a body resembling the cabinet or ministry of other countries, at its head being the grand-vizier, other members being the Sheikh-ul-Islam, the ministers of war, foreign affairs, the interior, finance, public works, marine, justice, education, commerce, &c. The immediate possessions of the Turkish Empire are divided into general governments or vilayets, at the head of each of which is a governor bearing the title of vali. The vilayets are themselves subdivided into sanjaks, administered by mutessarifs; and these again into kazas administered by kaimakams. The immediate possessions in Turkey in Europe are divided into vilayets bearing the following names:—Adrianople (nearly corresponding to the ancient Thrace), Saloniki (the greater part of ancient Macedonia), Monastir or Bitolia (Western Macedonia), Yanina (Southern Albania), Scutari (Northern Albania), and Kossovo (between northern Albania and Servia). Constantinople forms a vilayet by itself, which extends across the Bosphorus into Asia.

Military service is obligatory on all Mohammedans. The service lasts twenty years: six with the Nizam (or regular army) and first reserve, eight in the Redif, and six in the Mustafiz (or Landsturm). Adherents of other religions than Islam may be exempted from service on land, but are bound to serve in the fleet if called upon. The following was the war strength of the Turkish army in 1900:—

Active Army.....	350,000
Reserve (Ilaye).....	600,000
Redif.....	304,000
Mustafiz.....	120,000
Total.....	1,500,000

The whole empire is divided into seven army districts, each with an army corps (*ordu*), the head-quarters being at Constantinople, Adrianople, Monastir, Erzinjan (Armenia), Damascus, Bagdad, and Sanaa. The navy is relatively less powerful now than it formerly was. Some of its best ships were sold to Britain, and others have become nearly obsolete. There are probably not more than three sea-going iron-clads of any fighting capacity, though the total number of vessels included in the navy is over 100.

The financial condition of Turkey is thoroughly unsound. Since 1850 there has been almost a con-

stant deficiency in the revenue, and this deficiency is calculated at several millions annually for some recent years, though in 1897-98 there was an estimated surplus of about £73,720, the revenue and expenditure being respectively £16,660,190 and £16,586,470. Since 1854 Turkey has contracted a series of foreign loans, the total nominal capital of which recently amounted to about £250,000,000. In October, 1875, the government, being no longer able to pay the interest on the debt, issued a decree reducing the interest to one-half the amount for five years, converting the other half into capital bearing interest at five per cent. Having failed to pay even this, the government, on the 9th of July, 1876, issued another decree, announcing that no payments would be made. In 1881 a new arrangement of the foreign debt was effected by delegates of the bond-holders who met at Constantinople for the purpose. The capital was now reduced to £106,437,000, and the Turkish government agreed to hand over to a commission representing the bond-holders the excise revenues of Turkey—who have thus secured interest of 1 per cent since 1882. The total amount of the debt as now administered is about £140,000,000. Part of the debt consists in the balance of the war indemnity due to Russia. In addition to the foreign debt the country is burdened with an internal and floating debt.

The established religion of Turkey is Mohammedanism, the Koran being the manual of religious belief and practice as well as the guide in matters of law. The priesthood are under the rule of the Sheikh-til-Islam. Christianity, under the Greek form, is professed by a large majority of the Greeks and Bulgarians, and more partially by the Albanians, part of whom are Roman Catholics. Other religious bodies represented are Armenians, Syrians, Maronites, Protestants (not very numerous), and Jews.

Education is at rather a low ebb, though there are many public elementary schools, to which all Mohammedan children are required to be sent on reaching the age of six years. There are also a considerable number of secondary schools and medreses or colleges in connection with mosques. A university was established at Constantinople in 1900. There are, besides, various special institutions, such as an imperial art school, a Greek national school, a Greek theological seminary, military and naval schools, &c.

*Language and Literature.*—The Turkish belongs to the Ural-Altaic or Turanian family of languages, which is spread over all Middle and Northern Asia from the Caspian to the frontiers of China, and which has been extended to more western regions by the conquests of the Osmanli Turks. The language of this branch of the race is what is specially known in the West as Turkish. While the Eastern Turkish or Jagatai dialect is rough and hard, and preserves many archaic words and grammatical forms, the Osman Turkish is softer and more melodious, and at the same time more polished as to its inflections. On the other hand, the vocabulary of native Turkish in the Western dialect is very meagre, at any rate in the higher diction. The defect is made up by borrowing to an unlimited extent from the Arabic and Persian, so that the Turkish language as spoken and written in the Ottoman Empire presents the singular phenomenon of having its most important elements derived from three great groups of languages—Ural-Altaic, Semitic, and Indo-European. This large importation of foreign words has had a very injurious influence on the language.

The oldest literature in any dialect of Turkish is that of the Uigurs, a division of the Turkish race which preserved an independent nationality in the region to the west of Lake Baikal till about the

end of the twelfth century. They are said to have received some knowledge of Christianity at a very early period from Nestorian missionaries, from whom they probably derived their alphabet of fourteen letters formed from the Syriac. Their literature is said to have contained at one time translations of all the Chinese classics, but very few relics of it are still extant. The Eastern Turkish dialect, commonly called the Jagataian, flourished under Tamerlane and his successors for somewhat more than 100 years (about 1400 to 1530). The two most important names to be mentioned in connection with it are those of Mir Ali Shir, the vizier of Sultan Hussein, author of a collection of biographies of earlier Jagataian poets, with specimens of their works; and Sultan Baber, founder of the Mongol dynasty of Hindustan, and author of memoirs of his own life and times (ed. Vambéry, 1885). Turkish literature, in the narrower sense of the term, that is, the literature of the Western Turks, is rich in various departments of knowledge, besides poetry, but contains little original. Almost all its productions are imitations of Persian or Arabic models. Great linguistic interest attaches to a collection of three fourteenth-century treatises on falconry, forming one of the oldest monuments of this dialect, and first printed by Hammer (Pesth, 1840, with a translation into German). Among the Turkish poets the most notable are Mohammed Tchelebi, who in his *Muhammediyeh* (text and commentary, Bulak, 1840; text, Kasan, 1845) has made a complete collection of the legends relating to the prophet Mohammed; Lami, the greatest and most fruitful of the Osman poets; Fasli and Baki. Lami lived in the beginning of the sixteenth century under Soliman the Great, and in addition to various prose works, partly translations from the Persian of Jami, wrote four epic poems, the materials for which are all taken from Persian legends, as well as a number of lyric and didactic poems. Fasli is an allegorical poet (died 1563), and Baki (died 1600) is the most esteemed of the Turkish lyricists. In the sphere of tales and fables the most important productions are *Humayun-nameh* (Cairo, 1838), a translation of the Persian version of Pilpay's fables; the *Tuti-nameh* (Cairo, 1837), imitated from the Indo-Persian; *The Journeys of Sayid-Batthal* (Leipzig, 1871); *The Drolleries of Nasr ed-Din* (German, 1857); and the stories of the forty viziers of Sheikh Sade (translated by Gibb, 1886). For the history of the Turkish Empire the voluminous annals begun by Saad-ed-din and continued by other authors till towards the end of the eighteenth century are quite indispensable. The style of these historical works is affected, full of far-fetched metaphors and similes. Their chief contents have been made known by Hammer in his *Geschichte des Osmanischen Reichs*. In geography the most valuable works in Turkish are the *Geographical Dictionary of Haji-Khalfa* (who is also one of the most learned of Turkish historians), and the *Travels of Evlia-Effendi* (English by Hammer, London, 1834). For the knowledge of the doctrines of the orthodox Mohammedan sect of the Sunnites the sketch of Mohammed Pir Ali el Berkevî (Constantinople, 1802; French by Garcin de Tassy, Paris, 1822) is important. The various collections of *Fetvas*, or decisions in complicated legal cases, derive great interest from the close connection of Mohammedan law with religion, and from the glimpses they give us of the inner life of the East. In philology the Turks have done little for their own language, but much for the Arabic and Persian. The excellent Turkish translations of the Arabic dictionary of Jauhari by Vankuli (Const. 1803), of the equally celebrated Arabic dictionary *Kamus*, by Asim Effendi (Const. 1814;

Cairo, 1835), and of the Persian dictionary *Burhan-i-Kati*, by Achmed Emin Effendi (Const. 1799; Cairo, 1836) are deserving of special mention. The Persian-Turkish dictionary *Ferheng-i-Shuuri* (Const. 1742) is very valuable on account of its numerous citations from Persian poets. Equally important are the numerous commentaries on the favourite Persian poets, as those of Sudi on Saadi's *Gulistan* (Const. 1833), and on the poems of Hafiz (Cairo, 1885). Modern Turkish literature has been greatly influenced by the literature of Western Europe, and thus an entirely new character has been impressed upon it. Among those who have helped to make the Turkish literature known in other countries is Baron von Hammer (Hammer-Purgstall), who edited and translated a number of Turkish works. There are various grammars and manuals for English students, and a valuable Turkish and English Dictionary by J. W. Redhouse (four parts, 1884-87).

**TURKEY** (*Meleagris gallopavo*, see PL. IV. at art. ORNITHOLOGY), a familiar genus of Rasorial or Gallinaceous birds, belonging to the sub-family Meleagrinae, and distinguished by the bill being strong, with a keel or ridge; by the short wings with the fifth and sixth quills longest; by the broad and rounded tail; and by the stout tarsal scaly in front and spurred. These birds appear originally to have come from America, but are now perfectly acclimatized in Britain and other countries. The wild male bird is coloured with golden bronze hues, marked and varied by the blue and black lustre of the plumage. The head and neck are furnished with wattles and erectile structures, which, under excitement of sexual or other kind, exhibit varying tints and hues. In America these birds begin to mate about the middle of February. The Honduras or West Indian Turkey (*Meleagris ocellata*) is a second species of Turkey, of rather less size than the Common Turkey, but more brilliantly coloured. This latter species wants the tuft of hairy feathers seen on the breast of the familiar Turkey. The Honduras Turkey derives its specific name from the presence of eye-like spots of brilliant appearance on the tail-coverts.

The Brush Turkey (*Tallegalla Lathamii*) belongs to a different sub-family from the Common Turkey and is described under the head of TALLEGALLA.

**TURKEY-BUZZARD** (*Cathartes Aura*), the type of a genus of Raptores or Birds of Prey, belonging to the family Vulturidae or Vultures, and allied to the Black Vulture (*C. Iota*) or Zopilote. The Turkey-buzzard is also named Carrion Vulture, and derives its former name from the resemblance it outwardly bears to a turkey. It occurs in North America, but is also found in Jamaica, where it is known as the 'John Crow.' The size of this bird is about 2 feet 6 inches in length, and the weight about 6 lbs. The plumage is coloured of a blackish-brown hue. The bill of the male is pure white, otherwise there is little difference between the sexes in size or coloration. The nest is rudely constructed, and may be formed in the hollow of a tree. The eggs, numbering two or four, are of a dull-gray colour, marked by brownish blotches. The food consists of dead carrion of all kinds.

**TURKEY-RED**, a beautiful and durable colour produced by madder upon cotton cloth, and introduced into Western Europe from Turkey. The processes which a fabric undergoes in receiving this dye are numerous, and vary in different establishments; but the most essential in the production of the best colour is the preliminary treatment of the fabric with oils or fats, combined with certain other substances, such as carbonate of potash or soda. Turkey-red dyeing is supposed to have originated in India. Adrianople was long the principal seat of the industry in Europe,

Towards the end of the eighteenth century it was introduced in the neighbourhood of Glasgow, where, as well as in Lancashire, it is still carried on, alizarine being now used instead of madder.

**TURKOMANS.** See TURKISTAN.

**TURMERIC**, the dried tubers or rhizomes of *Curcuma longa* (natural order Zingiberaceae). It is used as a condiment, a test, and a dye. It is largely employed in India and China as a seasoning, and forms an important ingredient in curry powder. Un-sized white paper, steeped in an alcoholic solution of turmeric, when dried, is employed as a test to detect alkalies, which change its colour from yellow to reddish-brown. It is also used as a test for boric acid. Turmeric yields a yellow colour, which has great brightness, but little durability. Common salt and sal-ammoniac are the best mordants for it.

**TURNER, JOSEPH MALLORD WILLIAM**, an eminent painter, was born in London on April 23, 1775. He was destined when young for the same occupation as his father followed, that of hair-dresser, but the boy's tendencies towards art were so strong that his parent wisely allowed him to follow the bent of his inclination, and in 1789 he entered the Royal Academy as a student. After remaining there in that capacity for five years, and working actively at his profession for other five, during which periods he sent to the exhibition no less than fifty-nine pictures, he was elected in 1799 an associate of the Royal Academy. In the two following years he exhibited fourteen pictures, and in 1802 was elected an academician. Till this date he had chiefly been known as a landscape-painter in water-colours, but thenceforth he turned his attention to oil-painting, and in the ensuing half century produced at the Academy exhibitions upwards of 200 pictures. In 1807 he was elected professor of perspective in the Royal Academy, and the following year appeared his *Liber Studiorum* or Book of Studies, which Charles Turner, Mr. Lupton, and others engraved. Other works by him which were engraved are his illustrations of Lord Byron's and Sir Walter Scott's poems; Rogers's *Italy and Poems*; *The Rivers of England*; *The Rivers of France*, and *Scenery of the Southern Coast*. To enumerate the different paintings of Turner would be impossible. They have established him as the greatest of English landscape-painters, and earned for him the appellation of the 'English Claude,' to whom indeed many of his admirers pronounce him superior. Among his more famous pictures reference may specially be made to his *Kilchurn Castle*, *Loch Awe*; *The Tenth Plague of Egypt*; *The Wreck of the Minotaur*; *Calais Pier*; *The Fighting Temeraire Tugged to her Last Berth*; *The Grand Canal, Venice*; *Dido and Aeneas*; *The Golden Bough*; *Modern Italy*; *The Fall of Carthage*, and *The Building of Carthage*. The eccentricity of his colouring and indefiniteness of his figures, rendering many of his later pictures to ordinary observers nothing more than a splash or unmeaning medley, have been frequently animadverted on; and with respect to the pictures executed during the last twenty years of his life it cannot be denied, notwithstanding their unflinching suggestiveness, that much of this censure is well founded. In private life Turner was a man rather of reserved and unsocial manners, but the reports circulated of his parsimony and sullenness appear to have been quite untrue, and many instances are recorded of his liberal and generous acts both as a man and an artist. He died at Chelsea on the 19th of December, 1851. He never was married. By his will he bequeathed all his pictures, of which he had about sixty in his possession at his death, along with an immense number of engravings and sketches, to the nation, on condition of a suitable building being erected

within ten years for their reception. They have been placed in the Turner Gallery, occupying two rooms in the National Gallery. He also intended a large part of his fortune to be devoted to the formation of a benevolent fund for artists, but this intention, though clearly enough expressed, was set aside by the lawyers because of the somewhat confused nature of his will. Turner owes his immense reputation largely to the brilliant advocacy of John Ruskin (see in SUPP.) in his *Modern Painters*. Mr. Ruskin divides his career, from an artistic point of view, into five periods: a period of development, three periods of greatness, and one of decline. His developmental period ended with 1800. It includes these, among other works: *A View of the Archbishop's Palace at Lambeth* (1790), his first drawing exhibited at the Royal Academy; *The Pantheon the Morning after the Fire* (1792); *Moonlight: a study at Millbank* (1797), his first exhibited work in oils; *Morning on the Coniston Fells*; *Norham Castle on the Tweed* (1798), to which he owed his early success; *The Battle of the Nile* (1799), and *Dolbadarn Castle*, his diploma work. His first style lasted from about the beginning of the century to about 1820, and in it he 'laboured as a student imitating various old masters'. The principal pictures of this period are: *The Fifth Plague of Egypt* (1800); *The Tenth Plague of Egypt* (1802); *Kilchurn Castle* (1802); *Calais Pier* (1803); *The Shipwreck* (1805); *The Garden of the Hesperides* (1806); *Sun Rising through Vapour* (1807); *Apollo and the Python* (1811); *Snowstorm* (1812); *A Frosty Morning* (1813); *Crossing the Brook* (1815); *Dido building Carthage* (1815); and *The Field of Waterloo* (1818). The *Liber Studiorum* also belongs to the period of his first style. His second style prevailed, according to Ruskin, from about 1820 to about 1835, and was characterized by freedom from mere imitation and by striving for beautiful, ideal effects. Among the works which illustrate it are the following: *The Bay of Baie, with Apollo and the Sibyl* (1823); *Cologne* (1826); *Dido directing the Equipment of the Fleet* (1828); *Ulysses deriding Polyphemus* (1829), sometimes regarded as his masterpiece; *The Loretto Necklace* (1829); *Caligula's Palace and Bridge* (1831); *Childe Harold's Pilgrimage* (1832); *The Bridge of Sighs* (1833), one of his earliest pictures of Venice; *The Golden Bough* (1834); *Wreckers—Coast of Northumberland* (1834); *St. Michael's Mount, Cornwall* (1834); *Line Fishing off Hastings* (1835); and *Ehrenbreitstein* (1835). During his third period, 1835–45, he produced many splendid works of marked individuality, but shallow critics began to ridicule him and his work, and full appreciation of his genius did not come till Ruskin entered the lists in 1843. The following represent his third style: *Mercury and Argus* (1836); *Snowstorm, Avalanche, and Inundation* (1837); *Modern Italy* (1838); *Ancient Italy* (1838); *The Fighting Temeraire tugged to her last Berth* (1839), his best-known picture; *The Slave Ship* (1840); *The Giudiccia, Venice* (1841); *Depositing of John Bellini's three Pictures in La Chiesa Redentore* (1841); *The Splügen* (1842); *Lucerne* (1842); *The Campo Santo* (1842); *The Snowstorm* (1842); *Peace—Burial at Sea* (1842); *The Approach to Venice* (1843); and *Rain, Steam, and Speed* (1844). The remaining years of his life were years of decline, but his genius still asserted itself fitfully. In the *Dictionary of National Biography* the late Mr. Cosmo Monkhouse says of him: 'Other artists, like Claude, Cuyp, Crome, and Constable, have painted certain familiar aspects of nature with more fidelity and completeness, but no landscape-painter has equalled Turner in range, in imagination, or sublimity. His technique

in oils was unsound, but in water-colours it was supreme; and in oils his dexterity was such that he obtained unrivalled effects in that medium. It is impossible to estimate his power without study of his water-colour drawings, especially as so many of his finest works in oil are mere wrecks of what they were.' See Ruskin's *Modern Painters* and other works; biographies by Thornbury (two vols., 1862), Hamerton (1879), and Monkhouse (1882); Wornum's *Turner Gallery* (1859); Cook's *Handbook to the National Gallery*; &c. See also the article *PAINTING* for an indication of his position in the history of painting.

TURNER, SHARON, historian, was born in Pentonville, London, on Sept. 24, 1768. Educated at an academy in his native place, he was articled to an attorney at the age of fifteen, and took over the business on his master's death in 1789. His attention was early directed to the study of Icelandic and Anglo-Saxon, then almost wholly neglected, and after many years of patient work, largely of a pioneer character, he published a valuable *History of the Anglo-Saxons* (that is, of England) to the Norman Conquest (four vols., 1799–1805; 7th ed., 1852). He afterwards continued his history in works entitled *History of England from the Norman Conquest to 1509* (three vols., 1814–23), *History of the Reign of Henry VIII.: comprising the political history of the commencement of the English Reformation* (1826), and *History of the Reigns of Edward VI., Mary, and Elizabeth* (1829); the whole being republished uniformly in twelve volumes in 1839. He retired from business in 1829, and died in London on Feb. 13, 1847. During the last twelve years of his life he received a civil list pension of £300 per annum. His other works include: a *Vindication of the genuineness of the poems ascribed to the great Welsh bards, Aneurin, Taliesin, Llywarch Hen, and Merdhin* (1803); *Prolusions on the present Greatness of Britain and on Modern Poetry* (1819), a volume of verse; an epic on *Richard the Third* (1845); and a *Sacred History of the World as displayed in the Creation and subsequent events to the Deluge* (three vols., 1832), a popular work, written from the standpoint of narrow orthodoxy. Turner's *History of the Anglo-Saxons* was of the utmost value for the pre-Norman period, but it has been all but superseded by the works of later scholars.

TURNER, SIR WILLIAM, a distinguished anatomist, was born in Lancaster in 1832. He received his general education in private schools, and began the study of medicine in St. Bartholomew's Hospital, graduating with distinction in the University of London in 1857. He became a member of the Royal College of Surgeons in 1853, and in the following year was appointed demonstrator in anatomy in the University of Edinburgh, a post which he held till 1867, when he succeeded John Goodsir as professor of anatomy in that university. Since 1873 he has represented his university on the General Medical Council, of which he became president in 1898, on the death of Sir Richard Quain. He presided over the meeting of the British Association at Bradford in 1900, and delivered a valuable address on the progress of the cell-theory in biology. He has examined in anatomy on behalf of the universities of Oxford, London, and Durham, and has lectured before the Royal College of Surgeons. He has received honorary degrees from various universities, is a fellow of the Royal Societies of London and Edinburgh, and a member of many other learned societies. He was one of the founders, and is joint-editor of the *Journal of Anatomy and Physiology*, and he has contributed many papers to the transactions of learned societies, the *Challenger* reports, &c.



He was created a Knight Bachelor in 1886, and a Knight Commander of the Bath in 1901.

**TURNHOUT**, a town in Belgium, in the province of Antwerp, and 26 miles S.W. of the town of Antwerp. It has manufactures of linen, woollen, and cotton fabrics, coloured paper, playing-cards, and various other industries. In 1597 it was the scene of a victory of Prince Maurice of Nassau over the Spaniards, and in 1789 of the Brabantese over the Austrians. Pop. (1900), 20,945.

**TURNING**, in mechanics, a very ingenious and useful art, by which a great variety of articles are manufactured by cutting or fashioning them while they revolve upon an axis. The art of turning is so extensively applicable that it would require a volume to describe its uses and the methods of practising it. The largest columns, the most ponderous artillery, and the minutest pivots of watch-work, with all wheel-work, rotatory machines, vessels, &c., are worked in this method. See **LATHE**.

**TURNIP** (*Brassica rapa*), a cruciferous plant extensively cultivated for the sake of its esculent root. This latter varies considerably in colour, both of exterior and interior, as well as in size and form, in the varieties produced by culture. It is of a fleshy consistence, and has a sweet, somewhat pungent and agreeable taste. The radical leaves are oblong and lyrate; the upper ones entire; the flowers are usually yellow. The smaller varieties, in general, are most agreeable to the taste; but the quality depends very much on the nature of the soil, which should be sandy and light. The ordinary season of sowing is from the end of June to the beginning of August; but if it is desired to procure them throughout the season, they may be sown from March till September. Turnips are a wholesome article of food, much in use. The large-rooted varieties have been employed for fodder during the winter season from time immemorial in various parts of Europe and Asia, though as a field-crop turnips are of comparatively recent introduction into Britain. In England they were grown as a field-crop to be eaten by sheep towards the end of the seventeenth century, but in Scotland they were not much cultivated in this way for nearly a century later. In both countries, as also in Ireland, they now form a most important crop, and Scotland has a larger area under turnips in proportion to its arable land than either of the other countries. A good loamy soil suits turnips best, and they require farmyard or other manure and plenty of moisture. They are generally grown in drills. Turnips are classified as white-fleshed and yellow-fleshed, as long, tankard, round, and flat; as purple-topped, green-topped, &c. Some authorities would derive all ultimately from the cabbage; others, from *Brassica campestris*, the wild turnip or navew. The Swedish Turnip is probably a hybrid between *B. campestris* and *B. rapa* or *napus*. *B. napus* yields rape, cole, or colza seeds, from which a well-known fixed oil is obtained by expression. Turnips are very liable to the troubles known as anbury and fingers-and-toes. See also next article.

**TURNIP-FLY** (*Athalia centifolia*), a genus of insects belonging to the order Hymenoptera, and included among the Saw-flies. The larvae or caterpillars feed on turnips and destroy the leaves. They are called 'niggers' on account of their black colour, and pass their chrysalis stage in the ground. (See **PL II.** at **ENTOMOLOGY**.) Another insect known as the Turnip-fly is the small beetle *Haltia nemorum*, which feeds on the leaves of the young plant. The Turnip-aphis, the Turnip-weevil, &c., are also enemies of this crop.

**TURNPIKE**, a gate set up across a road, watched by an officer for the purpose, in order to stop

travellers, wagons, coaches, &c., to take toll of them.

**TURNSPIT**, a name given to a variety of Terrier dogs, from their being trained to turn the spits or roasting-jacks in mansions. The breed is now practically extinct.

**TURNSTONE** (*Streptopus interpres*), a genus of Grallatorial or Wading birds, so named from its habit of turning over stones and other objects on the sea-beach in its search for food. It occurs in Europe and in North America also, and is distinguished as a genus by having the bill curved upwards at its tip, by the tarsi being covered with broad scales, and by the hind toe being elevated on the tarsus. It runs with great speed, and is active in all its movements. The nest is built near the coastline; the eggs number four, and are olive-green, spotted with ash-blue and shaded with brown. The length is about 9 inches; the head is white and black, as also are the neck and breast; the under parts being pure white, and the legs and toes orange.

**TURPENTINE** is a resinous juice extracted from several trees belonging to the genus *Pinus*. English turpentine is from the Scotch fir. Venice turpentine, which is more thin and aromatic, is from the larch. Strasburg turpentine is from the silver fir. The common American turpentine comes from the *P. palustris*, which grows abundantly in the Southern States. All are obtained by exudation and hardening of the juice flowing from incisions made in the pine-trees. To obtain the oil of turpentine the juice is distilled, usually with water. Turpentine oils from different sources exhibit differences in their physical, more especially in optical properties. Their specific gravity varies from 0.86 to 0.88. They all contain hydrocarbons of the general formula  $nC_{10}H_{16}$ , called *terebenthenes*. Turpentine oils are decomposed by chlorine, with the production of hydrochloric acid and carbon; they are rapidly oxidized by strong nitric acid, with evolution of heat and light; with more dilute nitric acid they yield a number of oxidized products. Oil or spirit of turpentine, often called simply turpentine, and also 'turps', is employed pretty extensively in medicine, both internally and externally, and it is also widely used in the preparation of paints and varnishes.

**TURQUOISE**, or **CALAITÉ**, is a mineral of a bluish or greenish colour, feebly translucent on the edges, or opaque; hardness that of felspar; specific gravity, 2.63 to 3.00. According to Berzelius it consists of phosphate of alumina and lime, silica, oxide of iron and copper, and a little water. It is found in Persia, either in pebbles or in small veins. Cut and polished, it is used for ornamental purposes, a piece of fine colour, 5 lines by  $4\frac{1}{2}$ , being valued at about £10. See **GEMS**.

**TURRET-SHIP**. See **WAR-VESSELS**.

**TURTLE**, the name collectively given to various genera of Chelonian Reptiles, belonging for the most part to the family Cheloniidæ, the members of which are distinguished by the carapace or shell being more or less flattened and depressed, by the fore-limbs being longer than the hind-limbs, and by their inability to retract their head and limbs within the 'shell'; whilst the toes are inclosed within a membrane so as to convert the feet into swimming-paddles. The beak or snout is exposed and horny. These reptiles are found chiefly in tropical seas, and the food consists of both animal and vegetable matters. The best-known species is the Green or Edible Turtle (*Chelone mydas* or *viridis*), found on the Atlantic coasts of Africa and America, and chiefly caught at Ascension Island and in the West India Islands. These animals are brought to Europe and America chiefly for the purpose of making the famous turtle-soup; the hard parts of the



animal being useless. The eggs deposited on the beach are also eaten, and are regarded as delicacies. The Hawk's-bill Turtle (*C. or Caretta imbricata*) is noted as affording the erroneously-named material known as *tortoise-shell*, which is derived from the epidermic plates covering the back or carapace of the animal. This animal is found in the American and Indian Oceans, and the plates are removed by the rather cruel process of steaming and heating the animal, whilst after the removal of the plates the animal is allowed to go free, and in due time another but less valuable set is developed. The flesh is not eaten. The colour is yellow, marbled with dark-brown above. Occasional specimens have been found round British coasts. The Loggerhead Turtle (*Chelone caiana*, see Plate I. at REPTILES) is a third species, and appears to be of voracious and fierce nature. It occurs in tropical seas. The Leathery Turtle (*Sphargis coriacea*, fig. 8 of same plate) derives its name from having its back covered by a horny or leathery skin instead of horny plates. The back is ridged, and of dark-brown colour. This species occurs in the Pacific, Indian, and Atlantic Oceans, and may attain a length of 8 feet and a weight of over 1600 lbs. The limbs are well developed, and its natatory powers are very great. The flesh is said to be not only of disagreeable taste, but to prove injurious to those who eat it. The eyelids open vertically instead of horizontally. See also TORTOISE.

**TURTLE-DOVE** (*Turtur auritus*), a species of Columbidae or Pigeons, having a slender bill, long wings, with the second and third quills longest; a tail of rounded shape and moderate size; tarsi scaly in front; and the outer toe shorter than the inner digit. This dove is migratory in habits, arriving in England from Africa about the beginning of May, and shortly thereafter breeding. It is most commonly found in England in the southern counties, and builds its nest in the forked branch of a tree, laying two white eggs. Only one brood is produced in each year. The food consists chiefly of seeds. It leaves England about the end of August or beginning of September. This bird may be known by its possessing four rows of black feathers, tipped with white colour along the sides of the neck. The top of the head is of a slaty-brown colour, the upper parts being pale-brown, mottled with darker hue, and the abdomen and under tail-coverts white. The beak is brown, and the legs and toes brownish-yellow. The average length of this bird is about 11 inches.

**TUSCAN ORDER OF ARCHITECTURE.** See ARCHITECTURE.

**TUSCANY** (Italian, *Toscana*), formerly a grand-duchy, now a department (*compartimento territoriale*) of Italy. The area of the department is 9279 square miles, and the pop. (1901), 2,548,154. The interior of Tuscany is finely diversified. The chain of the Northern Apennines forms a considerable portion of its northern boundary, and sends out numerous ramifications over the country. The intervening valleys are distinguished alike by their fertility and their beauty. The largest and richest of these, that of the Arno, occupies nearly a sixth of the whole surface. The coast, though sometimes bold, is generally low, and lined by extensive swamps (*maremme*), from which, in summer, the air comes charged with pestilential vapours. Elsewhere the atmosphere is in the highest degree salubrious, and the climate mild, except on the principal chain of the Apennines, where it is often very severe in winter. Almost the whole of the soil is under cultivation, or covered with forests or natural pasture. Cereals cover a large area, and vineyards, olive-yards, and orchards are numerous. The favourite cereal crops are maize and wheat. Of the latter a peculiar species is cultivated solely for

the straw. In the low flats a good deal of rice is grown. By the poorer classes chestnuts are much used for food. The methods of cultivation are very imperfect, although the cultivators are very industrious. The metayer system of land tenure is general. Only wine of moderately good quality is produced. Oil also is more abundant than excellent, though that of Pisa and one or two other towns is well known in commerce. The produce of silk is considerable. Oxen and buffaloes are almost the only animals used for draught. The marble of Tuscany, especially that of Siena, is well known throughout Europe. The manufactures consist chiefly of straw-plait and straw-hats, and a great variety of articles in marble, alabaster, and mosaic. The trade is almost wholly centred in Leghorn. The people generally bear a high name for industry, sobriety, and honesty. The Italian spoken by the educated classes has long been admitted to be the standard of purity, though Rome claims a superiority for pronunciation. See ITALY.

Tuscany corresponds to the ancient Etruria, which was, however, of wider extent. (See ETRURIA.) After the fall of the Western Empire (476) it passed successively into the hands of the Ostrogoths (see GOTHs), Byzantine Greeks, and Lombards, under whom Etruria formed a duchy. The name of *Toscana* dates from this period. Charlemagne made it a Frankish province, and it was governed by marquises or dukes, who in course of time rendered themselves independent. In the twelfth and thirteenth centuries it became broken up into a number of small republics, only four of which were of the first consequence—Florence, Pisa, Siena, and Lucca. (See the articles on these towns.) From the first Florence occupied the leading place, and it gradually extended its territory. From 1406 to 1494 it held Pisa in subjection, and in 1509 it definitively united it to its own territory. In 1557 the territory of Siena was also annexed to the Florentine, and in 1569 Pope Pius I. granted to Cosmo I. the title of Grand-duke of Tuscany, which was confirmed to his successor in 1575 by the German emperor. The first hereditary rulers of the Florentine territory of the house of Medici, Alexander (1531–37), Grand-duke Cosmo I. (1537–74), Francis (1574–87), Ferdinand I. (1587–1609), Cosmo II. (1609–21), did much for their dominion, encouraged trade and industry, and maintained a certain independence between Spain, Austria, and France. But the period of the later Medici, Ferdinand II. (1621–70), Cosmo III. (1670–1723), and Giovanni Gaston (1723–37), was one of constant decline, and during the last twenty or thirty years of it Tuscany was completely under the influence of the house of Austria. When it seemed likely that the male line of the Medici was about to become extinct, it was agreed in the Peace of Vienna in 1735, between Austria and France, that the reversion of the grand-duchy should be given to Francis Stephen, duke of Lorraine (afterwards husband of Maria Theresa and German emperor), in return for the Duchy of Lorraine, which Francis agreed to give up to Stanislaw Leszczyński, ex-king of Poland. In 1737 Francis actually succeeded to the grand-duchy, and he reigned till his death in 1765, when he was succeeded by his second son, Leopold, who in turn assigned it to his second son, Ferdinand III., when he himself obtained the German Empire (1790). The mutations which took place in Tuscany, as in other parts of Italy, during the Napoleonic era, will be found recorded with sufficient detail in the article ITALY. It is enough to mention here that Ferdinand, after being driven from his dominions, recovered them in 1814 with some additions. Ferdinand died in 1824, and was succeeded by his second son, Leopold II., whose government latterly degenerated into so severe

a despotism that his subjects were eager to throw off his rule. In 1859 the alliance of France with Sardinia against Austria, the great supporter of Leopold, encouraged the popular party, and a demonstration having taken place at Florence, the grand-duke withdrew from the country. Tuscany was then annexed to Sardinia by a popular vote, and in 1861 became, with Sardinia, part of the Kingdom of Italy.

**TUSCULUM.** See **FRASCATI**.

**TUSSAC GRASS** (*Dactylis cæspitosa*), an exotic plant with a soft, tender, smooth foliage, forming large tufts 5 or 6 feet in height. It is a native of the Falkland Islands and the southern coasts and islands of South America, and also of New Zealand and some of the smaller of the Auckland group. The inflorescence is sometimes 9 inches or a foot long, and consists of a mass of soft, thin-sided spikelets. The stalks contain a considerable quantity of saccharine matter, and are much esteemed as food for cattle. For this reason successful attempts have been made to introduce the grass into some parts of the Orkney Islands and the Hebrides. The inner part of the stem above the root is edible by man. Tussock grass belongs to the same genus as cock's-foot (*Dactylis glomerata*).

**TUSSILAGO.** See **COLT'S-ROOT**.

**TUTENAG**, a white metal brought from China, containing nickel, zinc, and copper.

**TUYERE**, the nozzle of the blast-pipe in a blast-furnace or smith's forge. See **IRON**.

**TVER**, a town in Russia, capital of the government of the same name, beautifully situated in a plain on the Volga, 96 miles north-west of Moscow. It consists of the Kremlin or fortress, surrounded by an earthen wall, and the town proper; and occupies a large space, but has an inanimate, and in some parts an almost desolate appearance. The manufactures are numerous and varied, and the admirable position of the town secures to it a valuable transit trade, particularly with St. Petersburg and Moscow. Pop. (1897), 53,477.—The government has an area of 25,794 square miles, and a population of 1,812,825. The surface is elevated in the south, but slopes towards the north, gradually sinking into an extensive plain. Rye, barley, hemp, and flax are largely cultivated, and the forests are extensive.

**TWEED**, a river of Scotland, which rises in the south part of Peeblesshire, passes by or near to Peebles, Melrose, Kelso, Coldstream, from near which place it forms the boundary line between England and Scotland, and runs into the North Sea at Berwick. Its waters are clear and sparkling, and abound with salmon and trout, on which account it is much frequented by anglers. Its name is celebrated on account of its connection with some of the best literature of Scotland. Its length is 97 miles.

**TWEEDS**, a certain kind of cloth, so called from the fact that its manufacture originated and was long exclusively carried on in Galashiels, Hawick, Selkirk, Jedburgh, and some other places on the Tweed and its tributaries. It is distinguished by the softness and flexibility of its texture, qualities which result from the manner in which it is made, the yarns not being so finely spun, nor the cloth so closely woven or so thoroughly felted, as is the case with fine English cloths. Tweeds are also well known by their peculiar and endlessly varied patterns and mixtures of colours, produced by weaving with dyed yarns. The manufacture is of comparatively recent origin; but the great demand for the material has led not only to the rapid growth of the manufacture in its original locality, but also to its extension to various other parts of Scotland, and also into England, as well as to the imitation of the material in France and other continental countries. Some

of the English so-called tweeds cannot boast, as true Scotch tweeds, even of inferior quality, can, of freedom from shoddy, mungo, and cotton.

**TWELFTH-DAY**, the popular name of Epiphany (the 6th of January), which is the twelfth day from Christmas. In all Christian countries this was formerly (as it still is in most) a day of great festivity, and the evening of the day was the occasion of observing many curious customs. One of the most widespread of these was the baking of a cake (in England called twelfth-cake) with a bean in it, and dividing the cake among the partakers of the feast. Whoever got the piece with the bean in it was regarded as king for the remainder of the day, in France for the whole of the year. This custom is supposed to have been derived from that which prevailed among the Roman children at the end of the Saturnalia, of drawing lots with beans to see who should be king. In Italy it is customary to give presents to children on this day. See **BEFANA**.

**TWELVE TABLES, LAWS OF THE**, a code of laws compiled in ancient Rome in 451-450 B.C. See **ROME—History**.

**TWILIGHT**, daylight which continues after sunset. Twilight is occasioned by the reflection of sunlight from the higher parts of the atmosphere which are still illuminated after the sun has become invisible from ordinary heights. Twilight is supposed to last till the sun is about 18° below the horizon, but it manifestly is much influenced by the state of the atmosphere as to clouds, &c. In low latitudes, both on account of the quickness with which the sun sinks below the horizon and because of the transparency of the atmosphere, there is little twilight.

**TWILL**, a textile fabric, presenting an appearance of diagonal lines on the surface. It is produced by passing the weft in weaving over one and under two or more threads of the warp instead of over and under alternative threads as in plain weaving.

**TYBURN**, a turnpike at the west end of Oxford Street, London, was noted for the public executions of metropolitan malefactors which long took place near it. The turnpike was removed in 1829.

**TYCHO** (*Tyge*) **BRAHE** (properly *Von Brahe*), a celebrated astronomer, descended from an old and noble family, was born in Sweden in 1546, in Schönon or Scania, a province then subject to Denmark. He began his astronomical studies very early in life; and being sent in 1562 to the University of Leipzig to study law employed himself while there almost exclusively in astronomical observations. He returned to his native country in 1565, but soon left it again to go back to Germany. In 1573, when again residing in his native country, he married a peasant girl, and afterwards travelled to Italy and Germany. On his return Frederick II., king of Denmark, became his patron, allowed him a salary, and furnished him with the means of erecting the observatory of Uraniborg, on the small Island of Hven, lying in the Sound. In this retreat, where he was visited by various princes, he framed that system of the universe which is yet known by his name. He assumed the principle that the earth remains fixed and immovable in the centre of the universe, and that the sun and all the heavenly bodies revolve round it. We are indebted to his observations for a more correct catalogue of the fixed stars, for several important discoveries respecting the motions of the moon and the comets, and the refraction of the rays of light, and for some important improvements in astronomical instruments. His observations served also as the basis of Kepler's astronomical labours. (See **ASTRONOMY**.) On the death of Frederick II. in 1588 Brahe's position became uncomfortable, the new king, Christian IV., being prejudiced against him, so that he was deprived

of his pension. On this account he accepted in 1597 an invitation of the Emperor Rodolph II. to come to his court at Prague. Here he received a considerable salary and many aids in the prosecution of his studies, but he died in 1601. Tycho was a remarkable man for the age in which he lived, and his name is one of the most important in the history of astronomy. His works were written in Latin.

TYLER, WAT. See POLL-TAX.

TYMPANUM. See EAR.

TYNDALE, WILLIAM. See TINDALL (WILLIAM).

TYNDALL, JOHN, LL.D., D.C.L., F.R.S., an eminent physicist, was born at Leighlin Bridge, co. Carlow, 21st Aug. 1820, his father being a petty tradesman. He went to school till he was nineteen, and then joined the Ordnance Survey, with which he was connected for five years. He was then engaged in railway work, and in 1847 became a teacher of physics at Queenwood College, Hants. After studying in Berlin, and becoming acquainted with Faraday, Huxley, and other eminent men, he was appointed professor of physics in the Royal Institution, London, with which he continued to be connected till his retirement in 1887. Tyndall did a vast amount of valuable work by original investigation in various branches of science, especially magnetism, electricity, heat, light, sound, &c., on which he published many papers and several well-known volumes, such as *Lectures on Sound*; *On Light*; *Heat as a Mode of Motion*; *Forms of Water, in Clouds and Rivers, Ice and Glaciers*; *On Radiation*; *Lectures on Electricity*; *Fragments of Science*; &c. Mountaineering and the study of glacier phenomena had also a great fascination for him, and gave rise to his *Glaciers of the Alps*; *Mountaineering*; and *Hours of Exercise in the Alps*. He was president of the British Association meeting at Belfast in 1874, and delivered an eloquent address on the Darwinian theory, thereby causing a great commotion in orthodox circles. He was the recipient of numerous honours from learned bodies at home and abroad, and many of his books were translated. He died, 4th December, 1893, from an overdose of chloral, being then suffering from insomnia and rheumatism.

TYNE, THE, a river of England, formed by the junction near Hexham of the North Tyne and the South Tyne, rising respectively in the north-west of Northumberland and the extreme east of Cumberland. The united stream, which latterly separates Northumberland from Durham, passes Newcastle and discharges into the North Sea at Tynemouth, just after passing North and South Shields. Its whole course (to the source of the North Tyne) is about 120 miles, of which the 20 miles next the sea is tidal. The Tyne has, since 1854, been the subject of large engineering operations, consisting of extensive dredging, the building of long piers at its mouth, the construction of large docks, &c. By the construction of the piers and dredging at the mouth of the river the bar has been removed, and a depth of nearly 30 feet at low-water spring-tides has been attained, where previously there was but 6 feet. The deepened entrance and protection afforded by the piers enable vessels of the largest size to enter the Tyne in all kinds of weather. Shields harbour, about a mile up from the entrance between the pier-heads, has a depth (obtained by dredging) of 30 feet at low-water, for a length of about 8000 feet. As a further result of the dredging, from Shields harbour to Newcastle, a distance of about 8 miles, the minimum depth at low-water spring-tides is nearly 30 feet. The old stone bridge at Newcastle, passable only by river craft, has been replaced by a gigantic swing-bridge, allowing the largest sea-going vessels to pass. From Newcastle bridge to Scotswood suspension-bridge, a further distance of about 3½

miles, there is a depth of about 18 feet at low-water or 33 feet at high-water spring-tides. Thus from the sea to Scotswood suspension-bridge, a distance of about 14 miles, the river is navigable for large vessels. These improvements have added so largely to the trade of the river that the Tyne, in the amount of tonnage of vessels entering and leaving, now rivals the Mersey and the Thames.

TYNEMOUTH, a parliamentary and municipal borough of England, in the county of Northumberland, at the mouth of the Tyne on its north bank. Tynemouth, having both baths and a fine sandy beach, is much frequented for sea-bathing. There are many handsome buildings, a magnificent stone pier, a grand parade nearly a mile long, and the ruins of a picturesque old priory, rising abruptly from the sea. The public buildings comprise the parish church, St. George's Church, several other places of worship, town-hall, free library, Tynemouth palace and winter-garden, skating-rink, &c. The port of North Shields and several villages are included within the borough, which returns a member to Parliament. Pop. (1881), 44,118; (1891), 46,588; (1901), 51,390.

TYPE. See PRINTING.

TYPE-FOUNDING, the art of casting and finishing the types used for printing. (See PRINTING.) The metal of which types are formed is an alloy of lead and antimony, with generally an admixture of tin. In making types the letter is first cut upon the end of a steel punch. The punch is then driven into a piece of copper, which forms the *matrix* or bottom of the mould intended to produce the letter. The mould in which the types are cast is composed of two parts. The outer part is made of wood, the inner of steel. At the top it has a hopper-mouth, into which the fused type-metal is poured. The matrix is placed at the bottom of the mould, directly under the centre of the orifice, and is held in its position by a spring. Every letter that is cast can be loosened from the matrix only by removing the pressure on the spring. Each letter is cast by itself, the workman having a pot of the melted alloy beside him, from which he takes the necessary quantity with a small ladle. A skilful workman will turn out 500 good letters in an hour. A considerable piece of metal remains attached to the end of the type as it quits the mould, but this is easily broken off. The types are afterwards dressed and polished on each side, and a groove or channel is cut in their bottom to make them stand firmly on end. It is essential that each letter be perfectly symmetrical and square; the least inequality of their length would prevent them from making a fair impression. Each letter is finally tied up in lines of convenient length, the proportionate numbers of each variety, small letters, points, large capitals, small capitals, and figures, being selected when the fount of type is ready for delivery to the printer. Several type-casting machines have been invented, and some of them are now extensively used for making type.

TYPE-WRITER, a machine designed as a substitute for the pen in manuscript writing. Numerous forms of such machines are in existence, but we restrict ourselves to a description of a perfected form first produced in the United States, and now widely used both in the Old and the New World. Its principal recommendations are the facility and comfort with which it can be worked; its speed, which is more than twice as great as that of pen-writing; the legibility of the writing or rather printing produced by it; and its power of producing a certain number of copies of a writing by the same operation. The essential part of the machine is about 16 inches in height and breadth, and the same in width at the

widest parts. Writing is done by touching keys. The paper on which the writing is done is held between two horizontal cylinders  $8\frac{1}{2}$  inches in length, one of which, called the paper cylinder, is coated with india-rubber and has a diameter of  $2\frac{1}{2}$  inches. Under this cylinder, and below the paper also when it is inserted, passes an inked ribbon which is gradually wound from a drum at one side of the machine on a drum at the other. Beneath the ribbon is a circular hole 7 inches in diameter and a few inches in depth, round the circumference of which are attached at their fulcrums a series of levers bearing the types at their ends. When the key corresponding to a particular type is struck, the type-bearing arm rises, so that the type strikes the under side of the ink ribbon immediately above the centre of the circular hole, and causes the ribbon to make the desired impression upon the paper. Every time a key is struck the rollers move a little to the left, carrying the paper with them, and each letter is thus impressed at a proper distance to the right of the previous one. At the same time the ink ribbon makes a slight movement in the same direction as the paper. At the end of every word a space-key is touched in order that a suitable interval may be left between the words. Each key has marked upon it the sign that it represents. When a line of the paper is about to be finished the fact is indicated by the machine itself ringing a bell, and the operator thereupon touches a lever which at once brings back the rollers to the proper position for beginning a new line, and causes them to make a partial revolution, so that the paper receives the impression of the new line at a suitable distance below the previous one. When several copies of the same writing are wanted, all that is necessary is to put as many sheets of paper as there are copies required between the rollers, with a sheet of carbonized paper between each pair of sheets. As early as 1714 an Englishman named Mill obtained a patent for a writing machine, but the first practical type-writer was patented in America in 1867, and nearly all the subsequent machines are of American origin also. Of keyboard machines there are several types, those with type-levers, such as the Remington (above described), Calligraph, Yost, Bar-lock, and most of the best-known machines; and those with the types on a wheel or cylinder, as in the Hammond, Blickensderfer, &c. There are also several varieties of one-keyed machines. In some of the lever machines the levers carry two types each (e.g. Remington), and there is a shift-key to determine which of the two shall be impressed on the paper. Generally the two types are the same letter in lowercase and capital. The Hammond machine has three rows of types on its type-wheel, namely, lowercase, capitals, and figures and punctuation marks. It has accordingly two shift-keys.

**TYPHOID FEVER** was at one time called abdominal typhus, and was indeed confounded with typhus. Its synonyms are gastric and enteric fever. This disease depends upon evils existing in the locality from whence it springs, and is not communicated from one individual to another by the breath or by touch. It is essentially a disease arising from a defect or defects in the sanitary arrangements of the house, or the poison may be absorbed by milk or other fluids, and these, when imbibed, produce the disease. Milk, perhaps, is one of the most congenial soils that the typhoid germ can locate itself in, but water is certainly the most common medium by which it enters the human stomach, and is therefore the most ordinary vehicle by which typhoid is conveyed to its victims. It is quite evident that sewer gas when inhaled will not

give rise to this fever, and yet sewer gas is a most potent agent in the production of the disease. When this fluid permeates the atmosphere of a dwelling it has a depressing effect upon the vitality of those who inhale it. At the same time the nitrogenous compounds which form sewer gas are absorbed by the water in the cistern or by milk or other liquids, and thus convert these fluids into an appropriate nidus, in which the germs of typhoid can thrive and attain their deadly properties. These liquids are taken into the stomachs of the various members of the household, and if the germs gain access to the alimentary canal of a person whose vitality is impaired by breathing foul gases, or by any other cause, the disease is immediately set up. It attacks rich and poor alike, but it is particularly a disease of early life. It frequently has a course of thirty days, but no definite rules can be laid down on this point. It is very often followed by a relapse. The symptoms usually do not show themselves for a period varying from two or three to fourteen days after the entry of the poison. They commence with languor, chills, violent headache, thirst, very thickly furred tongue, pains in the limbs, so that at first the disease may somewhat resemble the onset of rheumatic fever. Soon diarrhoea sets in, accompanied by a distended and tender state of the abdomen. The temperature rises, the skin loses its moisture, the kidneys cease to act freely, and the tongue becomes dry and brown. Then a scanty rash appears over the chest and abdomen, which may soon disappear, only, however, to be followed by a new crop of spots. At this stage delirium and other serious symptoms set in, which indicate very great prostration and danger, and a frequent complication occurs in the bronchial tubes becoming inflamed, giving rise to bronchitis. At this stage, too, bed sores are apt to form, and should be carefully guarded against. As the disease advances, ulceration of the bowels takes place, which may give rise to severe, and often fatal, hemorrhage, or to perforation of the bowel, which is always fatal. The treatment consists in sustaining the vital powers while endeavouring to relieve the various symptoms and complications.

**TYPHOON.** See CYCLONE.

**TYPHUS FEVER** was at one time known as putrid, hospital, ship, or jail fever, and by many other names. It is essentially a fever of the poor, ill-fed, and badly-housed inhabitants of large cities. A well-ventilated and well-lighted dwelling cannot afford a harbour for this disease; indeed the disease, though very infectious in overcrowded, badly-ventilated, and ill-lighted dens, retains hardly any of its contagious properties in a large and airy house. The age at which the disease is contracted has a most important bearing upon the result. Young children are almost certain to recover from the fever, but as age advances the risk increases, and to such an extent that at the age of forty the chances of recovery are lessened. Another peculiarity of typhus is that it is not infectious till after the eighth day of the fever. The duration of the fever is from fourteen to twenty-one days, and when death takes place it is generally about the twelfth day.

Before the symptoms show themselves there is a period of incubation varying from two to twelve days. Then there is generally a rigor, followed by a hot, dry skin, a suffused condition of the eyes, a small pupil, thirst, a dull, stupid expression, great prostration, and costive bowels. Towards evening the patient is restless and irritable, and cannot sleep. About the seventh day a rash of irregular spots and of a dusky hue appears over the chest and back, but sometimes this is entirely absent. As the disease

advances the patient's strength becomes very much exhausted, the tongue loses all its moisture, and resembles a piece of dry cork; the urinary secretion is scanty, and sometimes is almost, if not entirely, suppressed. Delirium sets in, and the danger is often increased by the supervention of bronchitis, pneumonia, or pleurisy. About the twelfth day a crisis gradually sets in, which may be attended by a sleep, diarrhoea, a free perspiration, or copious flow of urine. The convalescence is slow and gradual, and some time elapses before the patient regains his wonted health and strength.

The treatment consists in combating the evils which give rise to the disease, in keeping the patient in a well-ventilated room, seeing that he is kept thoroughly clean, and preventing exhaustion by freely administering a light and wholesome diet.

**TYPOGRAPHY.** See **PRINTING**.

**TYR**, in northern mythology, the son of Odin, brother of Balder, not to be confounded with *Thor*. He was the god of war and victory. The Danes and Icelanders still call Tuesday after him—*Tirs-day* or *Tyrs-day*.

**TYRANT**, a word derived from the Greek *tyrannos*, which signified an absolute ruler. The word did not have originally the bad signification which we now attach to it; but as it is a rule which admits of very few exceptions, that the possessor of uncontrolled power, whether individual, corporation, or multitude, will abuse it, *tyrant* came at length to signify an abuser of power, particularly of the chief power in the state.

**TYRANTS**, a sub-family of Insectivorous Birds, allied to the Fly-catchers or Muscipidae, and included in the Dendrostraf section of the order. The Tyrants are distinguished by their bill being long, broad, and flattened at its base, and by its tip being hooked; by the nostrils being hidden by plumes and bristles; by the long pointed wings; by the tail being slightly forked; and by the tarsi being slender. These birds inhabit South America, and familiar examples are the King Bird or Tyrant Fly-catcher (*Tyrannus intrepidus*, see Plate II. at **ORNITHOLOGY**) and the Crested Tyrant (*T. cristatus*). Their name is derived from their pugnacious, tyrannical habits. They feed upon fishes, insects, and even kill smaller birds. The average length of the King Bird is about 8 inches, and the plumage is black, relieved by gray and white markings. Another genus of Tyrants is represented by the Fork-tailed Fly-catcher of South America (*Milvulus tyrannus*).

**TYRE**, one of the most celebrated cities of antiquity, and, with its elder sister, Sidon, the richest and most important commercial city of Phœnicia. Ancient Tyre was built partly on an island and partly on the mainland, the island being nearly  $\frac{1}{2}$  mile from the mainland. Alexander the Great, when he besieged Tyre, caused a causeway to be constructed from the mainland to the island, and the modern Tyre or Sûr, which occupies part of the former island, is still reached by a broad embankment. It is a place of 6000 inhabitants, including many Roman Catholics, besides Greeks and Protestants, with schools for the different bodies, a monastery and convent, &c. The part of the city situated on the mainland was called Old Tyre, and is assumed to have been the original city. The city appears to have existed only on the mainland when besieged by Nebuchadnezzar, but the insular fortifications formed its chief strength when besieged by Alexander the Great. As early as 1300 B.C. Tyre was a powerful city, enriched by commerce and refined by the arts. (See **PHœNICIA**.) The ancient Gades (Cádiz) and Carthage were Tyrian colonies. The most celebrated siege of Tyre was that carried on

by Alexander the Great. After several unsuccessful attempts to take it he at length formed a project to fill up the strait and unite the island to the continent. The city was taken in the seventh month after it had been besieged (July, 332 B.C.) It was again taken by Antigonus, after a siege of fifteen months, in B.C. 313. Three ecclesiastical councils were held at Tyre—the first in 335, when Athanasius was stripped of his bishopric and banished from Alexandria; the second in 448; the third in 519. Relics of the splendour of the ancient city are everywhere to be seen, as numerous and beautiful columns stretched along the beach, ruins of an aqueduct, and others.

**TYROL**, or **TIROL**, a province of Austria, including Tyrol Proper and Vorarlberg (part of ancient Rætia and Noricum), is bounded north by Bavaria and Lake Constance, west by Switzerland, east by Salzburg and Carinthia, south, east, and west by Venetia and Lombardy; area, 11,325 square miles. Vorarlberg forms the westernmost corner of the province, bordering on Lake Constance. In magnificence of scenery Tyrol is only inferior to Switzerland, of which it is a continuation, having like it its snowfields, glaciers, avalanches, and waterfalls. The Alps enter it from Switzerland in three chains, of which the central (the Tyrol or Oetzthaler Alps) is the loftiest, and divides the country into North and South Tyrol. The Brenner Pass, famed for its romantic scenery, is in this chain, and is traversed by the main highway to Italy from Germany. Between this central chain and that on the north lies the valley of the Inn, while the southern chain is separated from the central by the valley of the Adige and that called the Pusterthal, and is itself divided into an eastern and a western portion by the river Adige forcing its way through it. There are also innumerable minor valleys, all as well as the principal capable of cultivation. The drainage of North Tyrol is mainly carried to the Danube by the Inn, which is the only navigable river, that of South Tyrol is mostly conveyed to the Adriatic by the Adige. The large lakes Garda and Constance are situated on the confines of the Tyrolean territory; the interior lakes are numerous but small. About one-third of the surface is practically inaccessible, another third is occupied by forests, and the remainder, capable of cultivation, is largely occupied by commons, and mostly in a state of nature. Sheep and goats are the principal stock. The vine is cultivated, and the gardens and orchards produce the finest fruits in abundance. Cereals are cultivated, and minerals, especially iron and salt, are extensively worked, though less productive than formerly. Manufactures are numerous but not extensive. Silk, metal wares, wood articles, lace, and embroidery, are among the distinctive types. The transit trade is considerable. The Tyrolese are a simple, manly, loyal, and religious people, not without a share of superstition. The capital is Innsbruck, other towns being Bozen, Roveredo, and Trent. Tyrol anciently formed part of Rætia. It came into the hands of the dukes of Austria in 1359. It was ceded to Bavaria by the Peace of Pressburg in 1805, which led to a revolt under the celebrated Hofer and others. It was restored to Austria in 1814. Pop. in 1900, 979,878.

**TYRONE**, an inland county of Ireland, in the province of Ulster; bounded north-east by Londonderry and north-west by Donegal, meeting at an apex in the north; east by Lough Neagh; south-east, south, and south-west by Armagh, Monaghan, and Fermanagh; area, 806,658 acres. The surface is hilly, rising into mountains in the north and south, and declining to a level towards Lough Neagh. The soil on the lower districts is fertile and watered by numerous branches of the Foyle and Blackwater.

Of the total area of the county some 250,000 acres are under tillage, two-fifths is in pasture, about 9000 acres are in plantations, and nearly one-quarter is waste, bog, mountain, &c. Young cattle are reared in the hilly or mountainous districts, and numbers of them find their way over to Great Britain. Agriculture generally is in a backward state, but in the fertile parts is practised on improved principles. Coal, suitable for domestic purposes, is raised to a small extent near Dungannon in the eastern portion of the county and Coal Island; and lead, copper, and iron occur in small quantities. Linens, woollens, earthenware, whisky, beer, chemicals, &c., are made. Since the passing of the act of 1885 the county returns four members to Parliament. Principal towns, Strabane, Dungannon, Cookstown, and Omagh. Pop. (1881), 197,719; (1891), 171,278; (1901), 150,567.

**TYRRHENIAN SEA**, the name given in ancient times to the part of the Mediterranean Sea adjoining the west coast of Italy. It was borrowed by the Romans from the Greeks, who called Etruria Tyrrhenia.

**TYTLER**, PATRICK FRASER, a distinguished historian, was the fourth son of Alexander Fraser

Tytler (Lord Woodhouselee, a judge of the Court of Session), and was born at Edinburgh on 30th August, 1791. He was educated at the High School, and afterwards at the University of Edinburgh, with the view of following the paternal profession of law, and in July, 1813, was admitted a member of the Faculty of Advocates. He abandoned the bar, however, for literature, and from 1837 resided in London. The first volume of his great work, *The History of Scotland*—undertaken at the suggestion of Sir Walter Scott—appeared in 1828, and the ninth and last in 1843. It commences with the reign of Alexander III., and terminates with the accession of James VI. to the crown of England. It is a work of very considerable research, and is generally regarded as a standard history for the period. Among other works of Tytler's we may mention his biographies of the Admirable Crichton, Wicliff, and Sir Walter Raleigh, and his *Lives of Scottish Worthies*. His death took place on 24th December, 1849. His father (born 1747, died 1818) wrote *Elements of General History* and other works; and his grandfather, William Tytler (1711–92), also a lawyer and man of letters, was the author of an able work in defence of Mary Queen of Scots.

## U.

**U** is the twenty-first letter and fifth vowel of the English alphabet. The Greek *u* is supposed to have had a sound similar to the French *u* or German *u*. It was transliterated into Latin by *y* (from the form of the Greek capital letter), and that character having acquired an independent significance in modern languages the sound of many Greek derivatives has been changed by its use. With the Romans *v* and *u* were regarded as one letter, both vowel and consonant. The capital was written *V*, the small letter *u*; hence up till the present century many dictionaries combined the *u* and *v*. The consonantal sound of the Roman *u* appears to have resembled our *u*, as in *uespa* or *vespa*, a wasp. The normal vowel sound of *u* in Latin was, as it is in German and most of the modern languages allied to German or based on Latin, like the English *oo* in *good*, *wood*, &c. In English *u* has three sounds. The principal or name sound, as in *pure*, is strictly a diphthong. The close sound of *u* in English, as in *but*, is almost peculiar to the English language, but it is very similar to the sound of the unaccented French *e*. The third sound of *u* in English, whether short as in *full* or long as in *rule*, is the common Continental sound. The various sounds of *u* and *o* are frequently interchanged; thus, in Latin the Greek *os* is commonly transliterated *us*. *U* being represented by the Latin capital *V* is used in few important abbreviations. *U.S.* signifies *United States*; *IOU* is a recognized mercantile and legal abbreviation of *I Owe You*; and in Scotland *U.F.C.* signifies *United Free Church*.

**UBEDA**, a city of Spain, in Andalusia, in the province of Jaen, on the right bank of the Guadalquivir. This place was built by the Moors, and its whole aspect is still Moorish. It contains a fine cathedral and other interesting structures. The inhabitants are mostly engaged in agriculture. Pop. (1887), 18,713.

**UBES**, Sr. See **SETURAL**.

**UCAYALE**, or **UCAYALI**, a large river of Peru, one of the head-waters of the Amazon (which see).

It is upwards of 1000 miles in length, and is navigable by large vessels for 100 miles.

**UCKFIELD**, a town of England, in Sussex, 8 miles N.N.E. of Lewes, with a Perpendicular church (altered), other places of worship, a seventeenth-century grammar-school (reorganized), an institute, an agricultural school with farm, a technical school for females, brickworks, brewing, &c. Pop. (1891), 2497; (1901), 2895.

**UDALL**, or **UVEDALE**, NICHOLAS, English scholar and dramatist, was born in Hampshire in 1505, and was educated at Winchester and Corpus Christi College, Oxford, which he entered at the early age of fifteen, graduating in 1524. He is said to have imbibed Lutheran opinions and to have been on this account prevented from getting his M.A. degree till 1534. He now became headmaster at Eton, a post which he held till 1541, when he was dismissed and imprisoned for a disgraceful offence. His reputation did not permanently suffer, however. He continued to hold till 1544 the vicarage of Brin-tree to which he had been appointed in 1537, and he gained the favour of Catharine Parr, queen of Henry VIII. Under her patronage he translated part of Erasmus's *Paraphrase of the New Testament*. He was also in high favour at the court of Edward VI., and held more than one benefice. On the accession of Mary he continued to maintain himself in favour, and from 1554 till shortly before his death he was headmaster of Westminster. He died in London on Dec. 23, 1556. Udall is now only remembered by his comedy *Ralph Roister Doister*, a somewhat rude work in rhymed verses licensed in 1566 but probably written as early as 1540. Several editions of this earliest of English comedies have since appeared, among them one in Arber's *Reprints* (1869) and one in Doddsley's *Old Plays* (1874).

**UDDER**, the name given to the mammary or milk glands of many domestic animals and their allies. The Ruminantia (which see), including the Sheep, Oxen, Goats, &c., form the group of Mam-



malia to the mammary glands of which the term 'udder' is commonly applied. The glands in the udder are united together so as to form a compact mass, but the teats or nipples are distinct.

UDINE, a town of North Italy, capital of province Udine, 60 miles north-east of Venice. It forms a kind of double town—an outer and an inner—both surrounded by walls. It contains a castle (now barracks) on an eminence, a cathedral, archbishop's palace, museum, technical institute, &c. The silk industry is important, and there is a considerable trade, especially in flax and hemp. Pop. in 1901, 37,933.

UEBERWEG, FRIEDRICH, a German writer on philosophy, was born at Leichlingen in Rhenish Prussia on Jan. 22, 1826, and died at Königsberg on June 9, 1871. He studied at Göttingen and Berlin, and in 1868 was appointed professor of philosophy at Königsberg. His works comprise: *Über die Echtheit und Zeitfolge der Platonischer Schriften* (1861); *System der Logik und Geschichte der logischen Lehren* (fifth edn., 1882; Eng. trans., *Logic and Logical Doctrines*, 1871); *Schiller als Historiker und Philosoph* (1884); and *Grundriss der Geschichte der Philosophie* (eighth edn., 1894-97; Eng. trans., *History of Philosophy*, two vols., 1874), a work of great value for the fulness of its biographical and bibliographical material.

UFA, a town of Russia, capital of the government of same name, on the Bielaya, at the confluence of the Ufa, 735 miles east by north of Moscow. It is defended by a citadel; is the see of a bishop, and has a number of handsome and regular streets, and considerable manufactures and trade. Pop. (1897), 49,961.—The government was separated in 1865 from Orenburg; area, 47,185 square miles. On the east, where it is bordered by the Southern Urals, the country is mountainous, wooded, provided with excellent pastures, and rich in minerals. It is well watered by the Bielaya, with its tributaries, and has abundance of good arable land. To the west of the capital the country becomes flat, and to the south steppes prevail. Pop. (1897), 2,220,497.

UGANDA, a British protectorate in the region of the great lakes of Equatorial Africa, bounded on the east by the British East African protectorate; on the south by German East Africa and Victoria Nyanza; on the west by the Congo Free State; and on the north by the Egyptian Soudan. The total area is about 150,000 square miles, and within it are included the native states or territories of Uganda proper, on the north-west shore of Victoria Nyanza; Usoga, north of the same lake; Kavirondo, north-east of that lake; Unyoro, north-west of Uganda and extending to Albert Nyanza; Koki and Buddu, south of Uganda; and Ankole, in the extreme south-west of the protectorate. Most of the protectorate is over 3500 feet above sea-level. The great Rift Valley of East Africa traverses the extreme east of the protectorate, and contains the lakes Naivasha, Baringo, Rudolf, &c., the last-mentioned being outside of the protectorate. The northern half of Victoria Nyanza, a small eastern portion of Albert Edward Nyanza and the whole of the associated Lake Dweru, the whole of Albert Nyanza, and the large irregular expansion of the Victoria Nile known as Lake Kioga, are all in the protectorate. The chief rivers are the Victoria Nile, flowing from Victoria Nyanza to Albert Nyanza, the Semliki, only partly in the protectorate, flowing from Albert Edward Nyanza north to Albert Nyanza, and the Upper White Nile, a boundary river. The greatest mountain feature in the protectorate is the snow-capped range of Ruwenzori on the western frontier, which attains in its highest summits, Duwoni and

Kiyanja, an elevation of at least 20,000 feet. Next to it Mt. Elgon (14,200 feet), a great extinct volcano in the east of the Central Province, with curious caves and fine falls, deserves mention. A series of lofty mountains (Kikuyu, Laikipia, Mau, and Elgeyo escarpments, Suk Mts., &c.) flanks the Rift Valley, among their chief peaks being Mt. Nyiro (10,000 ft.), Mt. Londiani (10,000 ft.), and Mt. Chibcharafan (10,000 ft.). The main mass of the Uganda plateau appears to consist of Archæan gneisses, schists, and granites. Among the plants collected or observed in the protectorate are acacias, dracænas, tall lobelias of striking appearance, the red-hot-poker plant, sun-flowers, euphorbias, white balsam, the magnificent *Spathodea*, fan, date, raphia, and other palms, baobabs, bananas, papyrus, fig-trees, screw-pines, tree-ferns, junipers, cycads, tree-heaths, bamboos, &c. The vegetation on the slopes of the higher mountains, notably on Ruwenzori, is of great interest, and includes many forms identical with or closely allied to common British species. The vegetation and scenery of the Nandi plateau, to the east and north-east of Victoria Nyanza, are said by Sir Harry Johnston to be remarkably like those of much of England. The fauna includes the lion, leopard, cheetah, serval, civet cat, genets, hunting dog, hippopotamus, gazelles, hyenas, zebras, aardwolf, rhinoceros, elephants, jackals, wart-hogs, buffaloes, monkeys, bats, chameleons, deadly puff-adders, pythons, flamingoes, storks, pelicans, cranes, geese, herons, cormorants, egrets, sacred ibises, ostriches, turacos, gray parrots, hornbills, a fine pigeon, vultures, owls, many kinds of antelope (eland, oribi, hartebeest, &c.), one or two kinds of giraffe (okapi, five-horned giraffe), termites, biting ants, brilliant butterflies, &c. The climate is healthy where the elevation is not lower than 3500 feet above sea-level, and the only very unhealthy places are small areas on the shores of Lakes Albert, Victoria, Kioga, and Baringo, &c. Violent thunderstorms are frequent, and mosquitoes are often a serious plague. The principal products which are or may be of commercial value are ivory, skins, hides, live stock, bees' wax; coffee, india-rubber, sugar, tobacco, cotton, fibres, various kinds of timber, dyewoods, drugs, gums, grain (chiefly maize and millets), oil-seeds, spices, chillies; and among minerals iron, plumbago, and salt.

The protectorate is divided for administrative purposes into six provinces, Eastern, Rudolf, Central, Nile, Kingdom of Uganda, and Western, the first being under the administration of the East Africa Protectorate. The Kingdom of Uganda is subdivided into twenty administrative divisions, and each of the other provinces into three, four, or five districts. The Eastern Province roughly occupies the part of the protectorate east of Lake Victoria and Mt. Elgon and south of Lake Rudolf. In it are included the Uganda part of the Rift Valley with the lakes previously mentioned, and also Kavirondo Bay, a gulf of Victoria Nyanza. The south and the north of the Rift Valley are rather sterile regions, but the main part of the province consists of 'rolling grass-lands, dense forests of conifers, and bamboo-covered mountains'. In the south-east there are numerous signs of past and present volcanic activity, notably the steaming fissures about El Burro. North-west of the Eastern Province, across the River Yala, lies the Central Province, which extends north from Victoria Nyanza. Its great feature is Mt. Elgon, and among its other mountains are the beautiful Mt. Debasien (9700 ft.), Kamalinga (8000 ft.), Nakwai Hills (6000 ft.), Lohor Mts. (6050 ft.), Moroto (10,010 ft.), and Berkate Hills (9300 ft.). Its lakes include Kioga, Salisbury, Gedge, Norman, and Mporogoma; and among its



rivers are the Nzoia and Sio, flowing into Victoria Nyanza. South-west of the Central Province, across the Victoria Nile, is the Kingdom of Uganda, extending from Victoria to Albert Nyanza, and including Buddu and Koki in the south. It is 'one interminable series of rounded hills, many shaped like tumuli, covered with pasture grass of fair quality, but much of it spear-grass. The hills are of red marl and shaly gravel, with much of iron-ore slag. The valleys are generally of black marsh soil, and full of coarse elephant-grass. The hills are usually some 300 feet above the valleys, and their elevation is about 4200 feet' (Lugard). There is an almost complete absence of running water, the rivers being merely large papyrus swamps. The marshes are crossed by native causeways of white sandstone built up between stacks of palisades. Dense tropical forest occupies much of Kiagwe, the most easterly district. This province contains Mengo, the capital of the kingdom, with Fort Kampala beside it, and Entebbe, on the shore of Victoria Nyanza, the present British capital. The banana is the chief cultivated product of Uganda. The Sese archipelago, Buvuma, and other islands in the lake belong to this province. The Western Province (districts Unyoro, Toro, Ankole) extends from the southern boundary north to the Victoria Nile. Unyoro contrasts strikingly with Uganda. It has low, rugged granite hills, mostly bare on the top, and often of fantastic form. They contain many large caves, to which the natives frequently resort. Trees are fairly plentiful, and both on the hills and in the valleys there is much rich soil. The chief feature of Toro district is the Ruwenzori range, near which are outliers of the great Congo forest. Ankole contains the large lake Kachera and a large number of small crater lakes. North of the Western and Central Provinces lies the Nile Province, with several scattered peaks and ranges (Mt. Agoro, 9400 ft.), and east of it, extending to Lake Rudolf, is Rudolf Province, with the Turkwel river and some hills of moderate height.

Sir H. H. Johnston distinguishes five main stocks in the population. The pygmy-prognathous type is represented in the Ruwenzori region and by limited groups elsewhere. The Bantu type is the most important, and constitutes the great body of the population in the Western, Uganda, and Central Provinces. The chief Bantu peoples are the Bakonjo of the Semliki-Ruwenzori region; the Bairo of Ankole; the Batoro of Toro district; the Banyoro of Unyoro district; the Baganda, or people of Uganda proper; the Basoga, or people of Usoga; and the Kavirondo, dwelling on the north-east shores of Lake Victoria. The Baganda, who are the principal race, are a fine people of quick intelligence and remarkable technical skill. Their typical national dress is made from the bark of fig-trees, but they also use skins, and are rapidly adopting European clothes. They do not practise tattooing, cicatrization, circumcision, or any other mutilation of the body, and they show a regard for decency and cleanliness which is rare among negroes. Their domestic animals are the ox, goat, sheep, fowls, and dogs. Their staple food is the banana or plantain, which is generally cooked when unripe, but they also eat sweet-potatoes, ground-nuts, maize, and other vegetable foods, besides fish and flesh. They drink a kind of beer made from the juice of the banana, and they grow tobacco and hemp for smoking. They are all nominal Christians or Mohammedans. They were formerly subject to a ruling race or aristocracy of Hamitic stock, the Bahima, who ruled them from Unyoro, but some four or five centuries ago they formed a separate kingdom under

a Bahima chief called Muganda. The Nilotic Negro type is found in the valley of the Nile below Albert Nyanza, and also elsewhere to a less extent. The Masai, Turkana, Nandi, Elgumi, &c., form another type not altogether distinct from the preceding; and there is finally the Hamite element represented by the Bahima, &c. The total population is under three millions. The revenue for 1902-1903 was estimated at £60,000. The government of the protectorate is carried on by a commissioner, consul-general, and commander-in-chief, who is assisted by a deputy-commissioner.

Uganda was recognized as within the British sphere by the agreement with Germany in 1890, and for a time it was under the Imperial British East Africa Company. The company withdrew in 1893, and a British protectorate was proclaimed in the following year. The protectorate was extended in 1896 over Unyoro, Usoga, and other neighbouring territories. The first foreign religion to secure a foothold in Uganda was Mohammedanism, but in 1877 King Mutesa admitted English Protestant missionaries, and French Roman Catholics followed in 1879. Afterwards English Roman Catholics also arrived in the country. The three groups of missionaries for long failed to work harmoniously together, and under Mwanga, Mutesa's successor, the Christians were cruelly persecuted, Bishop Hannington of Eastern Equatorial Africa being murdered in Usoga. Mwanga was expelled in 1888, but was restored two years later after professing Christianity. In 1891 the native Protestants and Catholics came into open strife, which was not allayed without difficulty and bloodshed. One of the most noteworthy of the Protestant missionaries was A. M. Mackay, who died in 1890. In 1897 Mwanga headed a revolt in Buddu, and after its suppression he fled into German East Africa and surrendered to the authorities there. His infant son was thereupon declared king, and a native council of regency appointed. In the latter part of 1897 a serious mutiny of the Sudanese troops broke out, and after it had been suppressed, the military force of the protectorate was reorganized. The railway from the coast (Mombasa) to Kisumu and Port Florence on Victoria Nyanza was completed in December, 1901. The best account of the protectorate is that given by Sir H. H. Johnston in his work on *The Uganda Protectorate* (two vols., 1902).

UGOLINO, COUNT. See GHERARDESCA.

UGRIAN, a term used in ethnology and comparative philology with somewhat different denotations. In ethnology it usually denotes a group of peoples of Mongolian stock extending from the rivers Ob and Ural in the east to the Baltic and the Danube in the west and south, and is thus an alternative name for Ugro-Finnish or Finno-Hungarian. In the science of language Ugrian, Ugro-Finnish, or Finno-Hungarian describes one of the great main branches of the Ural-Altaic (otherwise Turanian) group of languages. The Ugrian languages have no grammatical gender, and cases of nouns denoting locality are richly developed. Possessive suffixes take the place of our possessive pronouns. The verb has in general but two tenses, one for completed and the other for uncompleted action. Some of the Ugrian languages, such as Hungarian, have an objective conjugation of the verb, in which the personal object is expressed by a suffix. Most of these languages have a special negative conjugation, in which the negation is conjugated while the verb remains unaltered. See FINNS.

UHLANS, a species of light cavalry of Tatar origin. They were originally armed with lances, on which they carried a small coloured flag to frighten

the horses of the enemy. The Uhlans were adopted from the Tatars by the Poles, and subsequently by the Austrians, Russians, and Prussians. The Prussians, who adopted the Uhlans in the Seven Years' war, have used them very effectually in their later wars, particularly in skirmishing, reconnoitring, and scouring the country in advance of their armies.

**UHLAND**, JOHANN LUDWIG, a celebrated lyric poet and student of ancient German literature, was born at Tübingen in 1787. His earliest poetry dates from 1800, and he first appeared publicly as a poet by his contributions to various annuals in 1806 and succeeding years. The first collection of his poems appeared in 1815. In this year also he began to attract attention as a patriotic song-writer in connection with the political changes of the day, particularly those affecting his native state of Württemberg. In 1819 he was elected by his native town of Tübingen, and later by Stuttgart, to the assembly of the States of Württemberg, and was by the assembly elected a member of the permanent legislative committee. In 1830 he was appointed extraordinary professor of German languages and literature at Tübingen, but he resigned this appointment in 1833 to take his place as a representative in the assembly. In the general election of 1839 he retired without seeking re-election. In 1848 the electoral circle of Tübingen elected him their representative in the German National Assembly. He died 13th November, 1862. Among the fruits of his antiquarian researches are a treatise, *Ueber das altfranzösische Epos* (1812); *Ueber Walther von der Vogelweide* (1822); *Ueber den Mythos der Nordischen Sagenlehre vom Thor* (1836). An edition of his poems, together with his life, was published at Stuttgart in 1863. His dramatic poems, of which there are several separately published, are less esteemed than his lyrics.

**UIST**, NORTH AND SOUTH, two Scottish islands in the Hebrides, south of Harris, and separated from each other by the Island of Benbecula. North Uist is 16 miles long, with a breadth at most of 13 miles. The eastern part of the island is elevated, and the shore is much broken by inlets of the sea; the western portion lies low, and is the most fertile part, producing good pasture and crops of cereals, while sheep and cattle are reared. South Uist is 20 miles long, and averages about 7 broad. In the west it lies low; in the east is mountainous, the greatest elevation being 2500 feet. The island contains good pasture, and the inhabitants rear sheep and cattle. Both islands contain numerous lakes. pop. (1901), N. Uist, 2936; S. Uist, 3541.

**UJEIN**, or **UJJAIN**, a town of India, in Gwalior, 850 miles north-west of Bombay. It is 6 miles in circumference, surrounded by a stone wall with round towers. It contains Scindia's palace, a poor edifice. It is an ancient city, and still has a considerable trade in opium, &c. Pop. (1901), 39,892.

**UKASE**, or **UKAS** (Russian), signifies an ordinance of the government of the Russian Empire. The Russian law consists of a collection of the ukases of different emperors.

**UKRAINE** (from the Russian and Polish *ukraina*, 'the frontier'), an extensive country formerly on the frontier between Poland and Russia, now forming the Russian governments of Kief, Chernigof, Podolsk, Kharkof, and Poltava. It is watered by the Dnieper, which intersects it in a winding course from north to south.

**ULANS**. See **UHLANS**.

**ULCER** is a suppurating sore produced by the destruction of some part of the living structure, leaving a hollow from which matter is discharged. Ulcers may be either internal or external. The former are commonly very difficult of treatment; the latter are

more or less so according to the cause from which they originate. Sir B. Brodie has divided external ulcers into healthy, indolent, sloughing, and irritable. Healthy ulcers are the effect of wounds, surgical incisions, or similar causes, when they do not heal by the first intention. Indolent ulcers occur a little below the level of the skin, principally on the legs; they discharge flakes of coagulated lymph. Sloughing ulcers are those that spread by suppuration and absorption of the surrounding parts; they are attended with considerable pain; the discharge from them is offensive; and they cause considerable disturbance to the constitution. Sir A. Cooper calls them gangrenous ulcers.

**ULEMA**. See **MUFTI**.

**ULFILAS**, **ULPHILAS**, or **WULFILAS**, a bishop of the Goths, celebrated for his translation of the Bible into the Gothic language in the fourth century of the Christian era. He was born in 311; consecrated bishop by Eusebius of Nicomedia, probably at Antioch, in 341; and died at Constantinople in 381 (these dates are, however, doubtful). He was born on the north of the Danube, and his native language was Gothic, but he learned to speak and write Greek and Latin. Ulfilas was an Arian, and was called to Constantinople by the Emperor Theodosius shortly before his death to attend a conference or controversy on disputed matters of faith. He translated the whole Bible, with the exception of the Books of Kings, which he deemed too warlike for his inflammable Goths. He seems to have invented the Gothic alphabet, which is evidently based on the Greek. He employed the Septuagint for the Old Testament, and a Greek text, different from the received text, for the New. His translation is faithful, but not slavish. It was generally used by the Goths who migrated to Spain and Italy, but the Gothic language having died out in Southern Europe it was entirely lost, and only some fragments have been preserved. These consist of the greater part of the Gospels and epistles of St. Paul, fragments of Ezra, Nehemiah, and of a psalm. There are editions by Gabelentz and Löbe (1843-46), Heyne (9th ed., 1896), Balg (American, 1891), &c. This Gothic work is of the highest importance to the student of philology. See **GOthic**, **GOthS**.

**ULLSWATER**, or **ULLES-WATER**, a picturesque lake in England, between the counties of Cumberland and Westmoreland, about 9 miles long, and varying in breadth from  $\frac{1}{2}$  mile to 2 miles; depth, 210 feet.

**ULM**, a town of Württemberg, 45 miles S.S.E. of Stuttgart, on the left bank of the Danube, here crossed by one, and on both sides of the Blau, here crossed by five, bridges. It is a place of considerable strength, being provided with important defences on both sides of the Danube. It is an old town, irregularly built, with narrow, winding streets. It has a cathedral in the old Gothic style, with spire 530 feet high completed in 1890; manufactures of machinery, woollen and linen cloth, leather, paper, brassware, &c.; and an important trade. Ulm is advantageously situated, and was long an imperial free town. It forms an important military position, and the possession of it having been keenly contested in every great European war its prosperity has been seriously injured. The capitulation of Ulm, 17th October, 1805, was the turning-point of the campaign of Austerlitz. Pop. (1890), 36,201; (1900), 42,985.

**ULMACEÆ** (the Elm order), a natural order of plants, formerly a sub-order of *Urticaceæ*. They are exogenous trees or shrubs, with rough, alternate leaves, commonly deciduous, and each with a pair of deciduous stipules; flowers in loose clusters; calyx membranous; petals wanting; stamens definite, inserted into the base of the calyx; ovary superior

or 2-celled; ovules solitary; stigmas 2, distinct; fruit 1- or 2-celled, membranous or drupaceous; seed solitary, pendulous. The elms are natives of the north of Asia, India, China, Europe, and North America. In Europe and America they form valuable timber trees.

ULNA. See HAND.

ULPHILAS. See ULFILAS.

ULSTER, the most northerly of the four provinces of Ireland, comprehending the counties of Antrim, Armagh, Cavan, Donegal, Down, Fermanagh, Londonderry, Monaghan, and Tyrone. Area, 5,483,201 acres, or 8568 square miles. Pop. (1871), 1,823,163; (1891), 1,617,877; (1901), 1,581,351.

ULTRAMARINE, a beautiful and unchangeable blue pigment, which was originally obtained only from the rare mineral lapis-lazuli, but which is now manufactured artificially. The method of preparing ultramarine from lapis-lazuli is as follows:—The mineral is made red-hot, and thrown into water or into vinegar to render it easily pulverizable and to remove any calcium carbonate which may be contained in it. It is then reduced to a fine powder by levigation with a mixture of honey and dragon's-blood, and intimately mixed with a varnish formed of resin, wax, and boiled linseed-oil. After remaining at rest for some days this pasty mixture is put into a linen cloth and repeatedly kneaded with hot water; the first water, which is usually dirty, is thrown away, the second gives a blue of the first quality, and the third yields one of less value. The preparation of artificial ultramarine was first carried out on the manufacturing scale in accordance with the process of M. Guimet. The idea of preparing artificial ultramarine was suggested by the appearance of blue-coloured masses upon the hearths of old soda furnaces and limekilns. The composition of these masses proved to be almost the same as that of natural ultramarine. Ultramarine is manufactured by fusing a mixture of kaolin, Glauber salt, and charcoal in a closed crucible, roasting the green substance so obtained with the addition of sulphur, whereby its colour changes to blue, and pulverizing and washing the powder. Ultramarine is supposed to be a double silicate of sodium and aluminium with sodium sulphide, and one formula given for it is  $4(\text{Na}_2\text{Al}_2\text{Si}_2\text{O}_6) + \text{Na}_2\text{S}_2$ . This pigment is largely used in paper-staining, in dyeing, and in calico-printing, for colouring soaps, in the sugar industry, and also as an artists' colour. The manufacture is chiefly carried on in Germany, France, and Belgium.

ULTRAMONTANISM (from *L. ultra montes*, beyond the mountains—that is, Alps), the usual name for the views of those Roman Catholics who recognize the absolute authority of the Pope over all Catholics in every country, and his independence of the decrees of councils—views opposed by those who claim a certain degree of independence for the national churches and paramount authority for the decrees of councils. The infallibility decree promulgated by the Vatican Council in 1870 practically made ultramontanism a dogma of the Roman Catholic Church. Ultramontanism has been, and is still, an important factor in the political situation in Germany, France, and other European nations, especially since it is usually associated with other anti-national and anti-social claims.

ULVERSTON, a town and seaport of England, in Lancashire, 25 miles north-west of Lancaster, on some gentle declivities, about  $1\frac{1}{2}$  mile from Morecambe Bay, with which it is connected by a canal. Its chief buildings and institutions are an old Perpendicular church, market-hall, post-office, police-court, drill-hall, concert-hall, cattle-market, and cottage hospital. It has a paper-mill, shoe-factory,

blast-furnaces, boiler and other works. A little shipping is done, chiefly in exporting pig-iron. Pop. (1891), 10,015; (1901), 10,064.

ULYSSES (in Greek, *Odysseus*), a celebrated Greek hero, king of the island of Ithaca, son of Anticlea and Laertes. His wife was Penelope, by whom he became the father of Telemachus. He was one of the Greek princes who went to the Trojan war, in which he distinguished himself by his valour and sagacity. After the war he was exposed to a number of misfortunes during the ten years that elapsed before he reached his native country. He was thrown upon the coasts of Africa, and visited the country of the Lotophagi, and of the Cyclopes, in Sicily. Polyphemus seized him, with his companions, six of whom he devoured (see POLYPHEMUS); but the prince, having intoxicated him and put out his one eye, escaped from the cave. Æolus, whose island he visited, gave him a bag of winds to carry him home. His companions opened the bag, the winds escaped, and they were driven back to the Island of Æolus. Again sailing onwards he reached a land inhabited by cannibal giants, the Læstrygones, from whom he escaped with only one ship. Then he was thrown upon the island Ææa, where Circe changed his companions into swine. He escaped their fate by means of an herb which he had received from Hermes; and after he had obliged the enchantress to restore his companions to their original shape he yielded to her charms, and is said (not by Homer) to have made her mother of Telegonus. He next visited Hades, and consulted the soothsayer Tiresias how to return with safety to his country. Subsequently he passed along the coast of the Sirens (see SIRENS), and escaped the monster Scylla (who seized some of his men, however) and the whirlpool Charybdis. In Sicily his companions killed the sacred oxen of the sun, for which Zeus destroyed his ship by lightning, and all were drowned except Ulysses, who swam to Ogygia, the island of the nymph Calypso, where for seven years he had to remain, though yearning to return to Ithaca. The gods at last interfered, and Calypso suffered him to depart on a raft built by himself. Poseidon, still mindful that his son Polyphemus had been robbed of his eye by Ulysses, raised a storm and sunk his raft. Ulysses swam to the island of the Phæacians, where King Alcinoüs hospitably entertained him, and sent him home in a ship to Ithaca, after an absence of twenty years. He found his palace besieged by a set of insolent suitors for the hand of his wife Penelope, who insisted on her marrying one or other of them, and feasted and wasted his substance. With the aid of his son Telemachus he put the suitors to death. He is said to have lived about sixteen years after his return, and to have been at last killed unwittingly by his son Telegonus, who had landed in Ithaca with the hopes of making himself known to his father. The adventures of Ulysses in his return from Troy are the subject of Homer's *Odyssey*.

UMBALLA, or AMBĀLA, a town in Hindustan, in the Punjab, 120 miles N.N.W. of Delhi, 3 miles from the Ghaggar. It consists of a new and an old quarter, with cantonments several miles to the south-east. In the old quarter the streets are very narrow, elsewhere there are broad streets and roads, with many modern buildings, including a handsome church. There are many English shops, and a large trade is carried on. Pop. (1891), 79,294; (1901), 78,638.

UMBELLIFERÆ, an important natural order of herbaceous plants, which receives its name from its members having the flowers in umbels. Some of the plants of this order yield edible products, others resin-

ous and oily substances, others are poisonous. These differences arise from the various combinations of three common principles—an acid, watery secretion, a gum-resinous, and milky, and an aromatic, oily secretion. The predominance of the first produces poisonous, that of the second esculent, that of the third stimulant and carminative qualities. Among the esculents is the carrot. Anise, carraway, and coriander contain a volatile, aromatic oil; the assafoetida yields a foetid gum-resin, much used in medicine. The hemlock yields an oleaginous alkali called conia, which is an active poison, producing paralysis of the spinal cord. The Umbelliferae prevail most in temperate regions. In warm countries they are found at high elevations.

UMBILICUS. See NAVEL.

UMBRA AND PENUMBRA. See PENUMBRA.

UMBRELLA (from the Latin *umbra*, a shade). This useful article was first introduced into England from Italy, but at what period is uncertain. Dryden mentions it; and also Gay, in his *Trivia*, or, *The Art of Walking the Streets*, published in 1712. Although, however, umbrellas were known so far back, it was late in the 18th century before they came into general use. They were for a long time used exclusively by ladies, it being considered effeminate for a man to be seen with one. The umbrella is of Asiatic origin, and was originally used as a shade against the sun. When it was transferred to rainy climates the new adaptation of its use was obvious. It has from time immemorial been so well known in all the warm countries of Asia that it is impossible to discover in which of them it originated. It is more in use in China than elsewhere in Asia; but there is no evidence that it originated there. Except in that country the umbrella is nowhere in Asia an article in common use among the people. In most of the Asiatic nations it forms a distinction peculiar to royalty, while in some others it is also conceded to persons high in authority and place, particularly to governors of provinces, who in most Asiatic countries are, for purposes of government, invested with powers almost regal.

UMBRELLA-BIRD (*Cephalopterus ornatus*), a peculiar genus of Insectorial Birds, belonging to the group of the Cinirostris and included in the subfamily of the Gymnoderines or Fruit Crows. These birds derive their familiar name from the peculiar nature and form of the crest borne on the head. The bill is long, and the nostrils open by a large aperture. The males possess the head-crest, and have bare breasts, which, however, are provided with pendulous plumes. The third quill is the longest of the wings. The umbrella-birds inhabit Brazil and adjacent regions. Their average size is that of an ordinary crow; and the plumage is black, tinted with a rich purple gloss. Mr. Wallace has described the peculiar crest of these birds as being 'the most fully developed and beautiful of any bird known,' and as being composed of 'long slender feathers, rising from a contractile skin on the top of the head. The shafts are white, and the plume glossy blue, hair-like, and curved outward at the tip. When the crest is laid back, the shafts form a compact white mass, sloping up from the top of the head, and surmounted by the dense hairy plumes. Even in this position it is not an inelegant crest, but it is when it is fully spread that its peculiar character is developed. The shafts radiate on all sides from the top of the head, reaching in front beyond and below the tip of the beak, which is completely hidden from view. The top then forms a perfect slightly elongated dome, of a beautiful shining blue colour, having a point of divergence rather behind the centre, like that in the human head. The length of this dome from front to back is about 5 inches, the breadth 4 to 4½ inches. The tuft of feathers on the

breast grows from a fleshy central stalk about 1½ inch long. The food consists of berries and fruits, and the song is loud and clear.

UMBERIA, a territory of Italy, which derives its appellation from the Umbrians, by whom it was inhabited in ancient times. It now forms the province of Perugia.

UMPIRE. See ARBITRATION.

UNALASHKA. See ALEUTIAN ISLANDS.

UNCTION, EXTREME. See EXTREME UNCTION.

UNDERWRITER, the technical name applied to the subscriber of a marine policy of insurance. See BROKER and INSURANCE.

UNDULATORY THEORY, the theory which accounts for the phenomena of light and radiant heat as being caused by the undulations or vibrations of an all-pervading medium called ether.

Our notions of the behaviour of such a medium are best illustrated by the vibrations of the air in the case of sound; but the motion of a particle of ether when propagating a ray of light is at right angles to the direction of the ray, while the motion of a particle of air is in the direction of the ray of sound. When a sound is produced at a point we can conceive a series of concentric spherical shells of compression alternating with shells of rarefaction as successively produced in the air round this point, and in time reaching the ear of the listener. The exterior surface of the outside shell at any instant is called the wave front, and the distance from a point of greatest compression and the next point of greatest compression at any instant is a wave length; the distance of a particle of air from its position of rest, when it is at a point of greatest compression or at a point of greatest expansion, is the amplitude. In the case of light we can also imagine an instantaneous pulse of light as having a wave front; but here the condensation and rarefaction take place in directions lying in the wave front, and a wave length will be the distance between two successive wave fronts which are perfectly similar in their conditions of compression and rarefaction. The distance of a particle of ether on the wave front from its initial position of rest to its position when the wave front is in its state of greatest compression and expansion is the amplitude. To give our conception of a wave front of a simple pulsation of light proceeding from a point we might take a globe and cover its surface with a net-work of equal, regular hexagons, and say that at one time of greatest compression and expansion the lines represent the region of greatest compression, and that at the next time of greatest compression and expansion the lines represent the region of greatest expansion; and in changing from one of these conditions to the other the wave front passes through every intermediate condition. If now we take one of these hexagons we can consider its motions as being those of a single ray whose direction is the straight line joining the centre of the hexagon with the point of light. The direction of motion of the particles of ether is radially between the centre of the hexagon and its perimeter. It is conceivable that the presence of other material mediums along with the ether may give resultant directions of motion, arranged not radially but in two sets, as from opposite sides of a square or rectangle, to either of which figures our hexagon may in this case change; and in this way we come to a conception of plane polarized light. If by some means the ray receives a twist so that the square or rectangle is set on one corner as compared with its first position the planes of polarization are said to have been rotated. If we suppose a particle of the ether as receiving an impulse, or a restraint having an effect as to direction of motion equivalent to an





impulse at right angles to its rectilinear path at the instant when it is at the end of its path, the resultant motion will be an ellipse or a circle; and this is what is understood by elliptical and circular polarization. We do not give what we have said above as being certainly descriptive of what occurs, but merely as convenient ideals which have been found useful in giving meaning to the terms wave, wave length, amplitude, planes of polarization, &c. It appears that in space where there is only ether (if there be such space in the universe), and through space in which the medium co-existing with the ether is perfectly transparent (a medium whose molecules absorb no energy, whose condition does not change, and which does not rise in temperature on the passage of light), each molecule gives up to its neighbouring molecules exactly as much energy as it itself received in the same way from previously affected molecules, and is then exactly in the state in which it was before it received the impulse. The molecules of ether are stepping-stones by which energy passes without loss from one part of the universe to any other. When a ray of light is passing through a medium its velocity is diminished owing to the restraining action of the molecules of the medium upon the molecules of ether, even when the medium is transparent to the ray: And when a number of different rays (rays having different rates of vibration) enter a medium some of these rays will be absorbed (rays which have peculiar sympathy with the ordinary motions of the molecules of the medium) and will heat the medium. It is owing to the retardation of the ray on entering a denser medium that we can have the results produced by the various kinds of lenses; and the science of spectral analysis is a discrimination of substances by our being able to discover what particular rates of light vibration the molecules of the substances absorb. The emission theory of light accounted for the bending of rays towards the normal on entering the surface of a denser medium by supposing that the molecules of the medium attracted the particles of light, and hence the velocity of light should be increased by the medium; an experiment of Foucault by means of a rotating mirror gave a means of proving that the velocity of light is diminished in a denser medium, and this has been accepted on all hands as settling the controversy which for a long time divided scientific men on this subject. The emission theory can be traced to Empedocles and Democritus, but it was completed and rigorously brought into agreement with the known phenomena of light by Newton, whose great name gave it support until the theory was clearly proved to be untenable.

The first notions of the undulatory theory are found in the writings of Aristotle, and more recently it was advocated by Descartes, Malebranche, and Grimaldi; but Huygens was the first who gave the theory a definite shape, and since his time it has gradually been perfected so as to give an explanation of all the known phenomena of light, and so that many important results pointed at by the theory have on performing experiments thus suggested proved the accuracy of the theoretical surmises. Among those who have most notably advanced the subject, Dr. Young of Edinburgh holds a foremost place, and Fresnel and Cauchy may be mentioned as important contributors. It is impossible in a work like the present to give more than the mere sketch given above; but we hope the reader will, on comparing the various articles on light and heat with this sketch, have a good popular idea of the subject. For further information on the undulatory theory, the reader may consult Everett's edition of Deschanel's *Natural Philosophy*; Sir G.

B. Airy's *Undulatory Theory of Optics*; and Preston's *Theory of Light*.

**UNGULATA, or HOOFED MAMMALS**, a large and important order of Mammalia, distinguished primarily by the development of large nails, termed 'hoofs,' serving to protect the toes, and upon which these animals walk. This order is of somewhat compound nature, inasmuch as it includes in itself several groups accounted as distinct orders in former systems of Mammalian classification. As the order Ungulata at present stands it includes three divisions once regarded as of good value as Mammalian orders. These three groups are the Pachydermata (Elephants, Rhinoceroses, Tapirs, &c.), Solidungula (Horses, &c.), and the Ruminantia (which see) or those that 'chew the cud.' The Elephants have been separated out from the Ungulata to form, of themselves, a new order, the Proboscidea; and the Ungulates have been re-arranged, without regard to the constitution of the old orders, as follows:—

**UNGULATA.**—Section 1. *Artiodactyla*.—1. Omnivora: Hippopotami, Swine, &c.; 2. Ruminantia: Deer, Sheep, Oxen, &c. Section 2. *Perissodactyla*: Rhinoceros, Tapirs, Horses, Zebras, &c.

The distinctive features of Ungulates as a whole are found in the fact that no more than four fully-developed toes exist on each foot; these toes being provided with hoofs. No clavicles or collar-bones are developed, and the Placenta (which see), which is either diffuse or cotyledonary, is of the *non-deciduate* type. Two sets of teeth are developed. The molar or grinding teeth have broad crowns, and are adapted for the trituration of grain and other vegetable matters. The mammae or milk-glands of female Ungulata may be few in number when placed in the groin; or more numerous when abdominal in position. The intestine of Ungulata is very usually provided with a large cæcum; and the brain is convoluted on its surface, whilst, when viewed from above, the cerebellum or lesser brain is in greater part uncovered by the cerebrum or true brain. Regarding the classification of Ungulata, a primary character is found in the number of the toes of its included members. The section *Perissodactyla* includes those forms in which the toes are present in an odd number. Or, to be more definite, in this section the hind feet are odd-toed in all the members, whilst the fore-feet are odd-toed in all except the Tapirs. The dorso-lumbar vertebrae (that is, the vertebrae of the back and loins collectively) do not number less than twenty-two. The third digit or toe of each foot is symmetrical by itself, that is, does not form a pair with its neighbouring digit. The thigh or femur bears a third trochanter. The stomach is of simple character, and the cæcum is of very large size. The teats are inguinal in position; and if horns are developed they belong merely to the epidermis or outer skin layer, and are not supported by a bony core, whilst as regards position they exist in the middle line of the head. Where two horns exist (as in some Rhinoceroses) the second is situated behind the first. Belonging to the *Perissodactyle* Ungulata we find three chief families and genera—the Rhinoceroses, Horses, and Tapirs. The Rhinocerotidae, represented by the various species of Rhinoceros (see accompanying Plate I., fig. 5-6), possess three toes on each foot; the skin is usually thrown into folds; the muzzle is rounded and blunt; the molars numbering fourteen in each jaw. The nasal bones support one or two horns. These animals in the present day are confined to the Old World. The family Tapiridae or Tapirs (see the first plate, figs. 7, 8) possess a short proboscis, and as shown in the skull (8) the nasal bones project over the nasal cavity. The front feet have four toes each, but these are asymmetri-



cally formed, and the hind feet are three-toed. The Horses (figs. 9 and 10), Asses (11), and Zebras (12), with the allied Quaggas, constitute the family Equidæ or Solidungula. In these forms the feet possess but a single perfect toe each, inclosed in a hoof; although certain extinct Equidæ (for example, Hipparion and Anchitherium) had lateral toes more or less perfectly developed. The neck possesses a mane, and canine teeth are present in the males only. The curious and aberrant Mammals known under the name of Hyrax (fig. 4) are included by some naturalists in the family Rhinocerotidæ—an arrangement apparently sanctioned by similarities in the disposition and form of the molar teeth. The *Hyrax Syriacus* is believed to be the 'coney' of Scripture. The front feet have four, and the hind feet three toes, inclosed in hoof-like nails. No clavicles exist. The nose and ears are short, and the tail is rudimentary. No canine teeth exist, and the incisor teeth grow from permanent pulps like those of Rodentia. The placenta is zonary and deciduate. By the majority of naturalists the Hyrax is included in a special order of Mammals (*Hyracoidæ*), otherwise its nearest affinities are with Perissodactyle Ungulata.

The Artiodactyla, or 'Even-toed' Ungulata, are distinguished by the toes being present either to the number of two or four, the third toe of each foot forming a symmetrical pair with the fourth toe. When horns are developed these always exist in pairs, and are supported on bony 'cores'. The stomach is usually of compound nature, and the cæcum is small. The dorso-lumbar vertebrae number nineteen, and the thigh wants a third trochanter. The first section of Artiodactyla is named Omnivora. The family Hippopotamidæ, represented by the Hippopotamus of Africa (see the second plate, fig. 1), is distinguished by the feet possessing each four toes. The body is massive; and all three kinds of teeth are developed. The lower canines (see first plate, fig. 15) grow in the form of large tusks, the molars number twelve or fourteen in each jaw. The tail is short, and sparsely covered with hairs. The Suidæ or Swine form the second family, and are represented by the African Wart Hogs (*Phacochoerus*) (see first plate, fig. 13), by the American Peccaries (*Dicotyles*) (fig. 14), by the Wild Boars (*Sus*) (see second plate, fig. 4), Babyroussa Hogs (*Sus Babyroussa*) (fig. 5), &c., the latter forms being noted (as seen in fig. 5) for the immense development of the upper canine teeth, which in the males pierce the upper lip, and constitute curiously-contorted tusks; the lower canines also being largely developed. The Swine as a family are distinguished by the feet having two useful or functional toes only, and two rudimentary toes in addition. All three kinds of teeth are developed, the canines undergoing most frequent enlargement. The stomach is of comparatively simple structure. The second section of Artiodactyla is the Ruminants. The Ruminantia, distinguished by the compound nature of the stomach (see second plate, fig. 6), described in the article RUMINANTIA, are also characterized by the 'cleft' foot produced by the presence of a symmetrical and functional pair of toes, with two other toes placed on the back of the foot, and which do not usually touch the ground. In typical Ruminants (fig. 8), such as Oxen, Sheep, &c., no incisor or canine teeth, and only twelve molars, exist in the upper jaw. The lower jaw contains six incisors, two canines, and twelve molars. Several exceptions to this general rule, however, are to be noted in the Camels and Musk Deers. The Camelidæ or Camels and Llamas (Plate III., figs. 12, 13) form the first family of Ruminants, and are distinguished by the

presence of two canine-like upper incisors, whilst canine teeth also exist in the upper jaw. The feet are long, and are provided with two connected toes, the nails of which exist in the upper surface of the toe only, whilst the soles of the feet are very broad. No horns exist; and these animals are able to close their nostrils at will. The Llamas have no humps, and the toes are distinct. The Moschidæ or Musk-deers form the second family, and are represented by the Musk-deer of Central Asia (fig. 10), in which the upper canine teeth form tusks (fig. 11), whilst lower canines are present in addition. No horns are developed in either sex. The large family of the Cervidæ or Deer (not to be confused with the Antelopidæ or Antelopes) possess horns or antlers of solid structure, which are deciduous or shed annually; the males alone (save in the Reindeers) bearing horns. The Cervidæ further possess lachrymal or tear glands. This large family is not represented in Australia or South Africa; and as examples, the Elk (fig. 6), Reindeer (fig. 7), Stag (fig. 8), and Roebuck (fig. 9) may be cited. The family Cavi-cornia or Hollow-horned Ruminants includes the Sheep, Oxen, Goats, and Antelopes. These animals are known by the horns being persistent, and by their consisting each of a horny sheath surrounding a process of the frontal bone (see the second plate, fig. 8). No incisors or canines exist in the upper jaw. The feet are cleft, and accessory hoofs are developed on the back of the foot. The Antelopes (see Plate III., figs. 1-5) are distinguished from the deer by their permanent and 'hollow' horns, which may occur in both males and females. The horns are most frequently of annular shape and twisted conformation. Inguinal pores and lachrymal sinuses exist; but a beard or 'dewlap' is rarely developed. The Ovidæ or Sheep and Goats (see on Plate II., figs. 12, 13, 14) have curved and twisted horns in both sexes, with heavy bodies, short legs, and thick wool or hair. The goats have no lachrymal sinuses. The Oxen (Bovidæ) have simple rounded horns (when these are present at all) and no lachrymal sinuses. To this family belong the Bulls and ordinary Oxen (figs. 7 and 8), the Buffaloes (fig. 9), Bisons (fig. 10), and Musk Oxen (fig. 11); the latter being by some authorities regarded as true sheep.

The Elephants, although usually placed in a distinct order of Mammals—*Proboscidea* (which see), may claim to be regarded as Ungulates, from the feet being provided with largely-developed nails. Each foot possesses five toes. No clavicles exist. The nose is prolonged to form a flexible proboscis, at the extremity of which the nostrils open. The testes are abdominal throughout life. The breasts are pectoral in position, and the placenta is deciduate and zonary. The canine teeth are wholly wanting, and the molars are few in number and are ridged or tuberculate on their crowns. The upper incisors grow from persistent pulps and form tusks. No lower incisors are developed. The Indian Elephant (see on Plate II., fig. 2) (*Elephas* or *Elephas Indicus*) is known by its concave forehead, small ears, and by the development of tusks in the males only. The molar teeth exhibit a transverse pattern on their crowns. The African Elephant (*Loxodon Africanus*) has large ears, and a convex forehead; tusks appear both in males and females; whilst four toes exist on the front feet and three on the hind feet. The molars exhibit a lozenge-shaped arrangement of their surfaces.

UNICORN, a fabulous animal, described in ancient accounts as a native of India, with the body of a horse but of larger size, and with one horn of  $1\frac{1}{2}$  to 2 cubits in length on its forehead, perfectly straight, with a white base, black middle, and red tip. The unicorn

was adopted as a supporter of the royal Scottish arms, from which it has been introduced as the left supporter of the British arms, and has in this form been imported into India.

**UNIFORM**, the name given to the dress of any particular body of men who are incorporated for a common public object and distinguished by a particular style of apparel. Uniform is in a public what livery is in a private service. It is specially applied to the dress of soldiers, police, and custom-house or excise officers, or other servants of the central or local government whom it is necessary or convenient to distinguish by a uniform appearance. The general establishment of uniforms in the military services is comparatively modern, but is now universal in civilized communities. Most of the European uniforms are of sober colours. The prevailing colour of the British is scarlet, but in the South African War the dust-coloured cloth known as khaki, originally employed in India, was adopted on account of the protection afforded by its colour.

**UNIFORMITY**, *ACT OF*. See **NONCONFORMISTS**.

**UNIGENITUS DEI FILIUS** (so called from the initial words), a bull of Pope Clement XI. in 1713, which arose out of the Jansenist controversy, and by which that controversy, as far as the Roman Catholic Church is concerned, was violently and finally closed. (See **JANSENISM**.) The bull condemned 101 propositions of Quesnel's *Reflexions morales* (see **QUESNEL**), many of which were quotations from Scripture or the fathers, but they were declared to be condemned only in a Jansenist sense. The bull was resisted by Noailles, archbishop of Paris, and many others of the clergy, in spite of the insistence of Louis XIV. on its unconditional acceptance; and the controversy became hotter than ever, those who accepted it being called Constitutionists and those who resisted Anti-constitutionists. After the death of Louis XIV. the latter received some favour from the regent and pope, and an appeal to a general council against the bull was drawn up, from which they received the title of Appellants. Another appeal was made from the pope ill informed to the pope better informed. The controversy continued under the two popes who succeeded Clement XI., and was only concluded after the majority of Louis XV. in the pontificate of Clement XII. The Archbishop of Paris was persuaded to subscribe the bull in 1728, and in 1730 the parliament of Paris was compelled to register it. After this the opposition to it within the church was rigorously suppressed, and the Appellants, though for a time they continued to resist, gradually died out. The Jansenist controversy being almost confined to France the bull Unigenitus had comparatively little effect.

**UNIO**. See **MUSSEL**.

**UNION FABRICS** are textile fabrics made of a mixture of different materials, as cotton and wool, cotton and silk, and similar mixtures, in which flax, hemp, jute, &c., are mixed with other fibrous materials.

**UNION FLAG**, the national banner of the United Kingdom of Great Britain and Ireland, formed by the union of the cross of St. George—red on a white ground, the diagonal cross or saltire of St. Andrew—white on a blue ground, and the diagonal cross or saltire of St. Patrick—red on a white ground. This flag is often spoken of as the Union Jack; but it is not properly speaking a jack unless it is flown on the 'jack-staff,' or staff on the bowsprit or fore part of a vessel. The term Jack is believed to be derived from the name of the reigning sovereign James I., under whose direction the first Union Flag was constructed, and who signed his name 'Jacques.' The

national flag of England was the banner of St. George (described in heraldry as argent, a cross gules), and soon after the union of the Scottish with the English crown, by a proclamation dated 12th April, 1606, this was united with the Scottish national flag or banner of St. Andrew (azure, a saltire argent), thus making the first Union Flag. On the union with Scotland in 1707 a new and altered design for the Union Flag was adopted as the national flag. It is described in heraldic terms as azure, a saltire argent surmounted by a cross gules fimbriated or edged of the second. On the union with Ireland the Flag was again altered by royal proclamation, dated 1st January, 1801, the red cross or saltire of St. Patrick being now introduced. The Union Flag as still existing was thus formed. It is described heraldically as azure, the crosses saltires of St. Andrew and St. Patrick quarterly per saltire counterchanged argent and gules, the latter fimbriated of the second, surmounted by the cross of St. George of the third fimbriated as the saltire. The Union Flag when used by itself or as an independent flag is the national flag always used on shore. When it occupies the upper corner or canton next the staff of a red, white, or blue field, the flag so formed is called the Red, White, or Blue Ensign, and in this form it is only used on board ship. Except when used as a jack the Union Flag is only to be hoisted at sea on the following occasions:—1. At the mizen-top-gallant-mast-head of the ship which the king may be on board of, the royal standard and the lord high-admiral's flag (both of which are *personal flags*) at the same time being hoisted at the main and fore top-gallant-mast-heads respectively. 2. At the main-top-gallant-mast-head, as the proper flag to be worn by an admiral of the fleet. The Union Flag, with the addition of distinctive badges, is also used under certain circumstances; for instance, with a harp in the centre on a blue shield it forms the flag of the lord-lieutenant of Ireland; with the Star of India in the centre, surmounted by a crown, the flag of the governor-general of India; with the royal arms in the centre on a white shield, surrounded by a green garland, it is borne by ministers plenipotentiary, *chargés d'affaires*, &c., when on shore, or embarked in boats or other vessels, and so on. With a border of white of one-fifth the breadth of the flag it forms the signal for a pilot, being then flown at the fore. The use of the Union Flag, as forming part of a red, white, or blue ensign, is of some importance. Up to 1864 the admirals of the British navy were divided into three classes, distinguished as the Red, White, and Blue; and when in command of fleets or squadrons, the vessels under their orders hoisted the red, white, or blue ensign, according to the division to which the flag-officer or commodore in command belonged. By order in council of 9th July, 1864, however, it was directed that this classification should be discontinued, and that in future the white ensign should be used by all British ships of war in commission. These accordingly now carry the white ensign (divided into four quarters by the cross of St. George) with the union in the upper canton or corner next the staff. Merchant vessels are entitled to carry the red ensign only, with the union in the corner. When commanded by an officer of the Royal Naval Reserve merchant vessels may carry the blue ensign, but only after obtaining permission from the Admiralty.

**UNITARIANS**, a religious sect or congeries of sects, distinguished by the denial of the received doctrine of the Trinity. Many other consequences flow from this denial; and in regard to these the Unitarians are by no means agreed, hence a comprehensive definition of those who adopt the title can include only this one article of agreement. The

Unitarians call themselves Christians; but while some of them hold the pre-existence of Christ, and approximate in their views to the Arians or Semi-Arians of the primitive church (see *ARIAN* and *TRINITY*), others hold Christ to have been a mere man. A similar difference obtains in regard to their views on the authority of Scripture. Some regard the Scriptures as the only source of divine inspiration and the final authority in matters of doctrine; others regard them with various degrees of reverence or respect without considering their authority as final; others establish their religious principles on purely rational grounds, and esteem the Scriptures, like any other book, only in as far as they agree with them. The Arianism of the early church was mostly of the first type, as was that of Milton, and perhaps of Locke, Newton, and other eminent men of modern times who are claimed as Unitarians. In the Roman Catholic and Greek Churches the open profession of Unitarianism was never tolerated after the establishment of the orthodox creed, hence it was only after the Reformation that Unitarianism could acquire a separate standing. When Unitarianism reappeared at the Reformation it was persecuted both by Catholics and Protestants. Martin Cellarius, a former friend of Melancthon, was imprisoned for his views. Servetus was burned at Geneva in 1553. The sect was first tolerated in Poland and Transylvania. In the former country it flourished under the leadership of the younger Socinus, in the latter under that of his friend Blandrata. The Polish toleration was finally withdrawn in 1658, when the Unitarians were banished under pain of death. They dispersed in Germany and England. In England, where Unitarians were burned as well as on the Continent, full toleration was not granted till 1813. In the meantime it had leavened several of the Dissenting bodies, particularly the Presbyterians and the General Baptists. On the Continent, in like manner, Unitarianism progressed in proportion to the progress of Rationalism. The Remonstrants of Holland contained a large number of them, and their prevalence in Geneva led, in 1725, to the abandonment of the Helvetic Confession. In America Unitarianism first sprang up in New England, from which it spread rapidly. There are about 350 Unitarian congregations in the United Kingdom. The British and Foreign Unitarian Association is a body formed for the purpose of promoting 'the principles of Unitarian Christianity', and it is affiliated to the International Council of Unitarian and other Liberal Religious Thinkers and Workers, founded at Boston, U.S.A., in 1900. There is a Unitarian Home Missionary College in Manchester, but the leading ministers of the denomination have been trained at Manchester College, a free theological institution founded at Manchester in 1786, now in Oxford, after having been located in York and London. The number of professed Unitarian congregations in the United States is about 350, of which some two-thirds are in New England. The leading names in Unitarian thought during the nineteenth century have been W. E. Channing, Theodore Parker, and R. W. Emerson in America; John James Tayler, Charles Beard, and especially James Martineau in Britain; and in their writings, sermons, and biographies the various phases of the movement may best be studied. Joseph Priestley should also be mentioned as a pioneer of Unitarianism in England.

**UNITED BRETHREN** (commonly called *Moravians*), a religious body originally formed by the descendants of the Bohemian and Moravian Brethren. (See *BOHEMIAN BRETHREN*.) When these Christians were driven by persecution from their own

country many of them settled at Berthelsdorf, in Upper Lusatia, an estate of Count Zinzendorf, under whose leadership they founded a society. This colony, which was established in 1722, acquired the name of Herrnhut, from its situation on the southern declivity of a hill called the Hutberg. (See *HERRNHUT*.) The society which was formed under the leadership and according to the plan of Count Zinzendorf took the name of the United Brethren. Their object was to form a society on the model of the primitive church. Statutes were adopted and signed in 1727 under the name of a Brotherly Agreement. They adopted as articles of faith only those fundamental Scripture truths on which the leading Protestant denominations are agreed, together with a system of social compact and church discipline, the latter founded on that of the Moravian Brethren. As an official creed, when challenged by governments, they gave a general adhesion to the Augsburg Confession, which, however, they regarded as the creed of the majority, their ministers not being bound to its separate articles, but agreeing not to teach anything decidedly repugnant to them. They consider themselves not as a sect but as a society of Christians united to lead an active Christian life. Their general practice is to avoid discussions on speculative truths of religion and insist on a practical experience of the efficacy of the gospel as the essential of religion, to dwell in preaching on the manifestation of God in Christ, and to make the life, sufferings, and death of the Saviour the principal theme of their teaching. They avoid theoretical discussions on the mysteries of the divine nature, adhering in such matters to the language of Scripture; they hold that the Spirit of God continues to teach those who believe, not by revealing new truths, but by enabling them to understand the Scriptures; and they profess faith in the providential guidance of God in answer to prayer in the common affairs of life. Their social discipline does not extend to a community of goods. Marriages were formerly controlled by the elders; but though their consent is still necessary as a formality, it is given as a matter of course to all well-conducted applicants. None of their social regulations are considered as indispensable, but only as means of promoting active piety, and may be altered or amended on the better judgment of the society, for which purpose they hold legislative synods. The main sphere of their activity is the propagation of the gospel among the heathen, in which they have had a remarkable and successful career. This has spread the society in many countries, and local boards have been organized in England, America, and elsewhere for its government, while a central board of directors, called the Board of Elders of the Unity, administers the general affairs of the society. In towns and populous districts their social organization is relaxed, but they are always ready to form societies of their own and to supply the means of local self-governments, for which they tax themselves by a regular assessment. Frequently they work in common for the good of the society. Each particular community is governed by an elder, with the aid of a committee usually elected by the local members. Each has to provide and maintain a church and schools, with appropriate officers. In their own communities no one is permitted to be a householder unless he is a member in full communion and has signed the Brotherly Agreement. The temporary residence of strangers who submit to the discipline of the community is freely permitted. Balls, dancing, plays, gambling, and all promiscuous assemblies of the youth of both sexes are forbidden. Numbers of young persons of both

sexes go to their communities to be trained as missionaries, who reside respectively in a common house, under the superintendence of an elder or of a matron, called the House of the Single Brethren and the House of the Single Sisters. They have likewise a widows' house. Public meetings for religious or social purposes are held daily, besides special meetings on Sundays and festivals. They hold love-feasts, particularly before the communion, accompanied by vocal and instrumental music. On Easter morning there is a solemn commemoration of the departed. They discourage wearing mourning for the dead, and accompany their funerals with music.

**UNITED FREE CHURCH OF SCOTLAND.** an ecclesiastical body in Scotland formed on Oct. 31, 1900, by the union of the Free Church of Scotland (which see) and the United Presbyterian Church (which see).

**UNITED GREEKS** are Christians who originally belonged to the Greek Church, but whom the Roman Church has united with her own members on certain conditions. They have their own church government, and retain the old names of ecclesiastical dignities. Their priests wear beards and caps, and are allowed to marry under certain conditions. They retain the ancient rites, the Greek language during service, the strict Greek fasts, and the Lord's supper under both forms, in common with the old Greek Church. Such United Greeks are found in Italy, in the eastern parts of the Austrian monarchy, in Transylvania, Hungary, Croatia, Slavonia, Dalmatia, &c., and in parts of the Russian Empire. Their number is estimated at 5,000,000, of whom about 4,000,000 belong to Austria. See GREEK CHURCH.

**UNITED PRESBYTERIAN CHURCH,** the name adopted by that Scottish church which was formed by the union of the Secession Church (which see) and the Relief Church in May, 1847. The Relief Church originated in the secession from the Established Church, in 1752, of the Rev. Thomas Gillespie, who claimed for the congregations the right to elect their own ministers. At the time of its union with the Secession Church it numbered 113 congregations, while the Secession was made up of 384. Thus, at its incorporation the United Presbyterian Church started with 497 churches, and a membership of over 140,000. This religious body adhered to the theological doctrines taught in the Westminster Confession of Faith and the Larger and Shorter Catechisms. The system of church government differed from that of the Established and Free Churches only in having no intermediate court between the presbyteries and the supreme court, the latter of which was called a General Synod, and sat once a year. The grand distinguishing feature which marked the United Presbyterian Church was that it was a voluntary church. United Presbyterians set themselves accordingly against all state establishments of religion and all public and national endowments for the maintenance of Christianity in the country. A movement for union with the Free Church of Scotland, begun in 1863, culminated in the formal union of the two bodies at Edinburgh on Oct. 31, 1900. The new body thus formed is called the United Free Church of Scotland.

**UNITED PROVINCES.** See NETHERLANDS.

**UNITED PROVINCES OF AGRA AND OUDH,** an administrative division of British India, bounded on the north by Tibet; on the north-east by Nepal; on the east and south-east by Bengal; on the south mainly by Rajputana and Central India; and on the west by the Punjab, from which it is separated by the Jumna. The province of Agra consists of the divisions of Agra, Meerut, Rohil-

khand, Gorakhpur, Kumáun, Allahabad, and Benares, comprising in all thirty-seven districts; and the province of Oudh forms the two divisions Lucknow and Faizabad, with twelve districts. The area of Agra is 83,198 square miles; of Oudh, 23,966 square miles; total area, 107,164 square miles. In addition there are the native states of Rampur and Garhwal, with a total area of 5079 square miles; thus, the area of the United Provinces and native states is 112,243 square miles. These provinces belong almost wholly to the Gangetic plain, situated south of the Himalayas and north of the central plateau, but they include small portions of these two elevated tracts. The following natural divisions of the country may be particularized: (1) The Himalayan section, comprising the sources of the Ganges and the Jumna and the peak of Nanda Devi (25,635 ft.); (2) the Doab, or region between the Ganges and the Jumna, from the Siwalik Hills to Allahabad, a fertile, well-irrigated region; (3) the Rohilkhand plain, north of the Ganges, south of the Himalayas, and north-west of Oudh, including part of the *bhābar*, a region formed of the boulders and debris on the lower Himalayan ranges; and the *tarai*, a marshy and malarious tract of jungle following the *bhābar* along the base of the hills; (4) Oudh, extending from the Ganges to the Himalayas, watered by the Gogra, Chanku, Gumti, and Sai rivers; (5) Bundelkhand, a somewhat unfertile tract on the northern edge of the central plateau, south of the Jumna; (6) the Mirzapur region, south of the Ganges, similar to the preceding but with a more fertile alluvial portion; (7) the densely-populated tract between the Ganges and the Gogra, south-east of Oudh, a fertile alluvial plain watered by the Gumti and Sai rivers; (8) the trans-Gogra region, north of the Gogra, also generally fertile but merging northwards into the mountainous country. In the mountainous Kumáun region there are several small lakes known as *tals*; and in the Doab, Oudh, and the Benares division there are many marshes called *jhils*. South of the Jumna and lower Ganges there are numerous artificial lakes formed by embanking mouths of valleys. These are of ancient origin and are now used for irrigation. The total length of irrigation canals is over 12,000 miles, of which nearly 1400 miles are main canals. There are no canals for navigation only, but a considerable length of the main irrigation canals can be used for this purpose. The total area irrigated by these canals is over 2,000,000 acres. The total cultivated area is about 37,500,000 acres, and the area under forest is about 9,000,000 acres. The principal crops are rice, especially in the east; wheat, chiefly in the upper Doab; gram; barley, generally mixed with other crops, except in Benares division; *jowar* or great millet; *bajra* or spiked millet; maize; linseed, sesamum, rape, mustard, and other oil-seeds; sugar-cane, especially in the upper Doab, Rohilkhand, and the Ganges-Gogra tract; cotton, chiefly in the lower Doab; indigo and other dyes; opium, in the lower Doab, southern Rohilkhand, Oudh, and the Benares division; tea, to a small extent in Kumáun and neighbouring districts; tobacco. Among the fruits are mangoes, oranges, lemons, limes, guavas, custard-apples, plantains, pine-apples, pomegranates, melons; potatoes and other vegetables are grown; and among the forest products are *sal* and other timbers, gums, resins, dyes, and tans.

The principal lines of railway in the provinces are the East Indian, the Oudh and Rohilkhand, the Rajputana-Malwa, and the Rohilkhand and Kumáun. In addition to the native artistic in-

dustries there are an increasing number of factories on the European plan, including cotton and woolen mills (Cawnpore), soap-factories, paper-mills, sugar-factories, breweries, indigo-factories, ice-factories, engineering works, lace-factories, and the government opium-factory at Ghazipur. In 1901 there were 40,757,137 Hindus, 6,731,034 Mohammedans, 102,409 Christians, 84,401 Jains, 15,819 Sikhs, and a few Buddhists, Parsees, and Jews in the provinces proper, excluding the two native states. The number of students in public colleges was 2425; in public schools, 350,153; in private institutions (advanced and elementary), 80,921; in all, 433,499, the vast majority in each case being males. The examining university of Allahabad is at the head of the educational system of the provinces. The principal towns in order of population are: Lucknow, capital of Oudh; Benares; Cawnpore; Agra, the capital; Allahabad; Bareilly; and Meerut. The North-western Provinces were constituted under a lieutenant-governor in 1835 out of territory ceded in 1801-16, and in 1856 Oudh was annexed and placed under a chief commissioner. The first outbreak of the great mutiny occurred at Meerut, and both provinces were the scene of dramatic incidents during that struggle. Oudh was partially amalgamated with the N.-W. Provinces in 1877, the lieutenant-governor of the latter becoming also chief commissioner of the former. In 1902 the name was changed to United Provinces of Agra and Oudh. Pop. of Agra, in 1891, 34,254,254; in 1901, 34,858,705; of Oudh, in 1891, 12,650,831; in 1901, 12,833,077; of Agra and Oudh, in 1891, 46,905,085; in 1901, 47,691,782; of native states, in 1901, 802,097; of United Provinces and native states, in 1901, 48,493,879.

**UNITED STATES OF NORTH AMERICA**, a federal republic, occupying the whole of the central portion of the continent, between lat. 24° and 49° N., and lon. 67° and 125° W.; stretching from east to west between the Atlantic and the North Pacific Oceans, and from north to south between the Dominion of Canada and the Gulf and Republic of Mexico; greatest length, east to west, 2800 miles; greatest breadth, 1600 miles; area, 3,023,290 square miles. To the republic belong also Alaska, Hawaii, Porto Rico, the Philippine Islands, Guam in the Ladronea, and the eastern Samoan Islands. Cuba is under United States protection. Including it the total area is 3,755,130 square miles.

**Area and Population.**—The republic consists of forty-five states, four territories, and one district, besides the Indian Territory, Alaska, and the unassimilated foreign possessions. The following table shows the area and population of the component parts of the union, together with the dates of the formation of states and territories. The original states are indicated by an asterisk.

STATES AND TERRITORIES, AND DATES OF FORMATION.	Area in Sq. Miles.	Population in 1890.	Population in 1900.
<i>North Atlantic Division.</i>			
Maine.....(1820)	33,040	661,086	694,366
*New Hampshire (1788)	9,305	376,530	411,588
Vermont.....(1791)	9,565	332,422	343,641
*Massachusetts (1780)	8,315	2,238,948	2,805,345
*Rhode Island (1790)	1,250	345,506	428,556
*Connecticut (1788)	4,990	748,258	908,355
*New York (1788)	49,170	5,997,853	7,368,009
*New Jersey (1787)	7,815	1,444,933	1,838,669
*Pennsylvania (1787)	45,215	5,258,014	6,301,365
<b>Total.....</b>	<b>168,665</b>	<b>17,461,545</b>	<b>21,044,866</b>

STATES AND TERRITORIES, AND DATES OF FORMATION.	Area in Sq. Miles.	Population in 1890.	Population in 1900.
<i>South Atlantic Division.</i>			
*Delaware....(1787)	2,050	168,498	184,735
*Maryland....(1788)	12,210	1,042,890	1,189,946
District of Columbia (1791).....	70	280,392	278,718
*Virginia....(1788)	42,450	1,656,980	1,864,184
West Virginia (1863).....	24,790	762,794	968,900
*North Carolina (1789).....	52,250	1,617,947	1,891,992
*South Carolina (1788).....	80,570	1,151,149	1,840,812
*Georgia....(1788)	59,475	1,537,353	2,216,329
Florida.....(1845)	58,990	391,422	528,542
<b>Total.....</b>	<b>282,535</b>	<b>8,857,920</b>	<b>10,443,658</b>
<i>North Central Division.</i>			
Ohio.....(1802)	41,090	3,672,316	4,157,545
Indiana.....(1816)	36,350	2,192,404	2,516,463
Illinois.....(1818)	56,650	3,826,351	4,821,550
Michigan.....(1837)	58,915	2,093,889	2,419,782
Wisconsin.....(1848)	54,450	1,686,880	2,068,963
Minnesota.....(1858)	83,365	1,801,826	1,751,395
Iowa.....(1845)	56,025	1,911,896	2,251,829
Missouri.....(1821)	69,415	2,679,184	3,107,117
North Dakota (1889).....	70,795	182,719	319,040
South Dakota (1889).....	77,650	328,808	401,550
Nebraska.....(1867)	77,510	1,058,910	1,068,901
Kansas.....(1861)	82,080	1,427,096	1,469,496
<b>Total.....</b>	<b>764,265</b>	<b>22,362,279</b>	<b>26,353,640</b>
<i>South Central Division.</i>			
Kentucky....(1792)	40,400	1,858,635	2,147,174
Tennessee....(1796)	42,050	1,767,518	2,022,723
Alabama.....(1819)	52,250	1,513,017	1,828,697
Mississippi....(1817)	46,810	1,289,600	1,551,372
Louisiana.....(1812)	48,720	1,118,587	1,381,627
Texas.....(1845)	266,780	2,235,523	3,048,828
Oklahoma (Ter. 1890).....	39,030	61,834	398,245
Arkansas....(1836)	53,860	1,128,179	1,311,564
<b>Total.....</b>	<b>588,890</b>	<b>10,972,893</b>	<b>13,600,230</b>
<i>Western Division.</i>			
Montana....(1889)	146,080	182,159	243,289
Wyoming.....(1890)	97,890	80,705	92,531
Colorado.....(1876)	108,925	412,198	559,700
New Mexico (Ter. 1850).....	122,580	153,593	193,777
Arizona (Ter. 1893)	113,020	59,620	122,212
Utah.....(1896)	84,970	207,905	276,565
Nevada.....(1864)	110,700	45,761	42,384
Idaho.....(1890)	84,900	84,385	161,771
Washington....(1889)	69,180	349,890	517,072
Oregon.....(1859)	96,030	513,767	413,532
California....(1850)	158,960	1,208,130	1,486,063
<b>Total.....</b>	<b>1,187,535</b>	<b>3,027,613</b>	<b>4,068,436</b>
<i>Indian Territory (1854).....</i>			
Hawaii (Ter. 1898)	81,400	180,182	391,960
Alaska (Ter. 1868)	6,640	89,990	154,001
Indians.....	570,000	32,052	44,000
<b>Total.....</b>	<b>608,040</b>	<b>391,765</b>	<b>735,243</b>
<b>Total for States and Territories.....</b>	<b>3,599,930</b>	<b>63,014,015</b>	<b>76,856,102</b>
<i>Colonial Possessions.</i>			
Cuba.....(1898)	35,994	—	1,572,797 (1890)
Porto Rico....(1898)	3,600	—	953,243 (1890)
Philippine Islands (1898).....	115,825	—	8,000,000 (est.)
Guam.....(1898)	300	—	9,000 (est.)
Eastern Samoan Islands.....(1900)	80	—	6,000 (est.)
<b>Grand Total....</b>	<b>3,755,130</b>	<b>63,014,015</b>	<b>86,397,142</b>







In 1790 the first census of the United States was taken, when the population was found to number 3,929,214. Since then a census has been taken every decade with the following results: in 1800 the population numbered 5,308,483, being an increase at the rate of 35 per cent; in 1810, pop. 7,239,881, increase over 36 per cent; in 1820, pop. 9,633,822, increase 33 per cent; in 1830, pop. 12,866,020, increase 32.5 per cent; in 1840, pop. 17,069,453, increase 33.5 per cent; in 1850, pop. 23,191,876, increase 35.8 per cent; in 1860, pop. 31,443,321, increase 35 per cent; in 1870, pop. 38,558,371, increase 22.6 per cent; in 1880, pop. 50,155,783, increase 30 per cent; in 1890, 62,622,250, increase barely 25 per cent; in 1900, 75,620,859, an increase of somewhat over 20 per cent.

*General Features.*—The shores of the United States have a coast-line which, according to the report of the officers of the Coast Survey and of the Topographical Department, measures 12,609 miles, of which 6861 are on the Atlantic, 2281 on the Pacific, and 3467 on the Mexican Gulf. On the Atlantic and Gulf of Mexico it is generally low and shelving; on the west it is generally bold and rocky. The indentations are comparatively few, and of no great magnitude, but are more numerous on the east than on the west side. The most important on the Atlantic are Massachusetts Bay; Long Island Sound, between Long Island and Connecticut, and in connection with it the noble bay of New York; Delaware Bay, penetrating far into the interior between the states of New Jersey and Delaware; Chesapeake Bay, stretching north through Virginia and Maryland for about 200 miles; Albemarle and Pamlico Sounds on the coast of North Carolina. The Gulf of Mexico is an immense indentation of the Atlantic, and itself contains no sub-indentation of any consequence. The Pacific is also deficient in bays, but possesses in that of San Francisco, on the coast of California, one of the largest and finest natural harbours in the world. The coast of the Atlantic is remarkable for the almost total absence of islands, the only one of the least consequence over a range of more than 15°, from lat. 30° to 45°, being Long Island; and on the coast of the Pacific, though the islands are more numerous, they are all insignificant in respect of magnitude. The country exhibits two great mountain-chains, which stretch at a comparatively short distance from the opposite coasts, and in directions nearly parallel to them, and inclose between them a vast tract, sometimes so elevated as to deserve the name of a plateau, and so sterile as to present all the character of a desert, and at other times so depressed as to form a deep and level valley traversed by mighty rivers, belonging chiefly to the basin of the Mississippi, and spreading out into luxuriant prairies, rich alluvial plains, and boundless swamps, regularly laid under water. By far the loftiest and most magnificent of the two chains is that of the Rocky Mountains, which, entering from Mexico, of whose Cordilleras they may be considered a continuation, stretch north along the Pacific, at distances from it varying from 500 to 600 miles, and are continued into British America. They have a breadth of about 300 miles, and, besides throwing off several transverse ramifications, descend by a series of parallel ranges, of which that of the Sierra Nevada is the most elevated, towards the coast, and often give it very bold features. Within the United States they attain in Mounts Whitney and Shasta, both in the Sierra Nevada, the respective heights of 14,894 and 14,472 feet; in Gray's Peak, Pike's Peak, and Mount Lincoln, all in Colorado, the heights of 14,252, 14,212, and 14,128 feet respectively; Mount Hayden (Wyoming) is 13,858. The eastern chain, that of the Alleghenies, stretches in a similar direction along the

shores of the Atlantic, nearly from the Gulf of Mexico to the St. Lawrence, at a considerable distance from the shore in the south, but gradually approaching it towards the north. Though by no means destitute of magnificent scenery, the Alleghenies are much tamer than the Rocky Mountains, consisting rather of a long plateau crested with mountains and hills than of a well-defined continuous chain, occasionally rising in Vermont and New Hampshire to the height of 5000 or 6000 feet, culminating in Mount Mitchell, N. Carolina, 6688 feet, and only in Pennsylvania and Virginia attaining a breadth of 100 miles. The great plateau and valley inclosed by these two chains belongs almost entirely to the basin of the Mississippi, which is by far the largest river of the North American continent. (See MISSISSIPPI.) The principal tributaries of this river are the Missouri, the Arkansas, and the Red River on the right bank, and the Wisconsin, Illinois, and Ohio on the left bank. The country west of the Rocky Mountains, belonging to the basin of the Pacific, is of comparatively little width, though of very great length, and hence cannot boast of many large rivers. The most important are the Columbia; the Sacramento, which discharges itself into the Bay of San Francisco; and the Colorado, which falls into the Gulf of California. Between the Alleghenies and the Atlantic the principal rivers are the Connecticut, which falls into Long Island Sound; the Hudson, a magnificent stream, alike remarkable for its scenery and its navigable importance, which flows south for 300 miles, and contributes to form the harbour of New York; the Delaware, which, after a course of 300 miles, falls into the bay of that name, and is navigable by ships of the line to Philadelphia, a distance of 40 miles; the Potomac, which falls into Chesapeake Bay, and is navigable by the largest vessels to Washington, a distance, including the bay, of 200 miles; and the Savannah, which, after separating between South Carolina and Georgia, enters Savannah Bay, and being navigable for large vessels for 17 miles to the town of Savannah, there forms an important harbour. Besides the rivers, one of the most remarkable features of the United States, but common to them and Canada, is the chain of enormous fresh-water lakes—Superior, Michigan, Huron, Erie, and Ontario, which drain an area of about 90,000 square miles, and send its waters into the St. Lawrence, after precipitating the greater part of them in an accumulated mass over the renowned falls of Niagara, between the two last-mentioned lakes. In the interior of the country the most extensive lakes are those of Lake Champlain in the north, between the states of Vermont and New York; and the Great Salt Lake in Utah.

*Minerals.*—It has been estimated that the coal-fields of the Union have a total area of over half a million square miles, but the full extent of the coal resources of the country is far from being adequately known. Coal is found in about three-fourths of the states, but is chiefly worked in Pennsylvania (which produces about a third of the entire yield of the country), Illinois, Ohio, West Virginia, Alabama, Iowa, Indiana, Maryland, Kentucky, Colorado, Kansas, and Tennessee. The total yield for the United States as a whole was 225,607,649 short tons of bituminous coal and 60,242,560 long tons of anthracite in 1901. In some districts the coal is found so near the surface that the risk of underground working is avoided by stripping off the superincumbent stone and earth, and working the mineral as in a quarry. About a quarter of all the coal raised belongs to the anthracite variety, which is almost wholly obtained from north-eastern Pennsylvania. In the United States, as in Britain, iron ore figures

next to coal as the most valuable mineral raised. Iron ore, like coal, is widely disseminated, but it is mined on a commercial scale in only a few states. The principal iron mines are in Michigan, Minnesota, Alabama, Pennsylvania, Virginia, Wisconsin, Tennessee, New York, and New Jersey. The total amount of pig-iron produced in 1901 was 15,878,354 long tons, Pennsylvania heading the list, followed by Ohio, Alabama, Virginia, Tennessee, New York, Wisconsin, and West Virginia. In addition to this about 11,000,000 tons of steel were produced. As a gold-producing country the United States holds a place in the front rank, nearly a quarter of the world's annual production being supplied by its mines, which are chiefly situated in Colorado and California. During 1901 the total production of gold was valued at over £16,000,000. The value of the silver obtained amounted to £15,500,000, the largest quantity being produced in Colorado, after which came Montana, Utah, and Idaho. The extent to which the Union has drawn upon its gold and silver mines is seen in the statement that from the year 1793 up to 1900 the total quantity of gold reported has amounted in value to about £480,000,000, while that of silver has been about £350,000,000. Among the other metals occurring may be mentioned copper, chiefly from Montana, the Lake Superior district, Arizona, and Colorado, the value in 1901 being £17,400,000. Lead is widely distributed throughout the states, but principally in Colorado, Utah, Missouri, Kansas, Illinois, Wisconsin, and Iowa; the total production in 1901 was 270,700 short tons. A large proportion of the lead ore is argentiferous, and is worked for its silver contents, and not for the value of the lead. Zinc also occurs in considerable quantity, especially in Illinois, Missouri, and Kansas, the production in 1901 having amounted to 140,822 short tons. Nickel is widely disseminated, but not in large available deposits; it is worked chiefly in Connecticut and Pennsylvania. Petroleum has since 1860 formed an important mineral resource of the states of Pennsylvania and New York. It is found also in several other states, the chief next to those mentioned being Ohio. The total quantity of petroleum obtained in 1901 was 69,389,194 barrels. (See PETROLEUM.) Natural gas to the value of about £5,500,000 was obtained in 1901. Copious salt springs abound in various localities, and salt is produced in great quantities in New York, Michigan, Pennsylvania, Ohio, Kansas, and West Virginia. Extensive beds of gypsum are found in New York, Maine, Virginia, and other states, and in the large bed extending from the Arkansas river in the Indian Territory to the Rio Grande in Texas. Building materials, such as marble, fine granite, sandstone, porphyry, &c., are abundant. The total production of minerals of all kinds in 1901 was valued at £227,547,000, of which about £109,000,000 represented metallic minerals. For a general account of the geology see NORTH AMERICA.

*Climate.*—A vast country, stretching over 25° of latitude, and exhibiting all possible varieties of surface—low swampy shores, boundless alluvial plains, swelling hilly regions, elevated arid deserts, and lofty mountain chains—must obviously possess, not one climate, but a number of climates, not only differing greatly from each other, but often exhibiting the most remarkable contrasts. The only one feature which can be said to be common to all the climates of the United States is inconstancy. The transitions from cold to heat, from humidity to drought, take place so suddenly and to such an extent, that even in the central states a change of 5° in the thermometer, in the course of a few hours, is by no means

uncommon. On the northern frontiers these changes become still more marked, and on the other hand, at the opposite extremity, are so much diminished that the thermometer in Florida is almost stationary throughout the year, and at no time varies so as to give an annual range of more than 12°. Compared with Europe, the climate of the United States exhibits very remarkable differences. The isothermal line which passes through Belgium in lat. 51°, after crossing the Atlantic is found at Boston in lat. 42° 30'; and that which passes between Rome and Florence in lat. 43°, is found in the United States at Raleigh in lat. 36°. In the north of the States, between lat. 42° and 45°, nearly on the parallels of Rome, Toulon, Padua, and Bordeaux, the winter is so severe for three or four months that the snow is abundant enough for the use of sledges, and the ice of the rivers strong enough to be crossed by horses and wagons. In Philadelphia, lat. 39° 56', the mean annual temperature is 54° 9', whereas in Naples, lat. 40° 50', it is 63° 2'; in other words, the American town, which, from having a lower latitude, ought to have a higher annual temperature than the European town, is about 9° colder. The ranges of temperature are still more remarkable than the annual averages, and hence it has been said with truth, that while New York has the summer of Rome, it has the winter of Copenhagen. The average rainfall is estimated at 37½ inches, whereas in the north-west of Europe it is only 31½ inches, and yet in the United States, as the showers are more copious, and perhaps also more continuous, the number of rainy days is fewer. In the more elevated middle districts the climate is decidedly healthy, but on the low flats of the south, and the immense plains where the great rivers are continually overflowing their banks, cutting out new channels, and forming stagnant marshes, all the diseases engendered by miasmata prevail.

*Vegetation, Agriculture, &c.*—A large portion of the United States still remains in a state of nature, either because from its arid nature it never can be brought under profitable cultivation, or because the population is still too thinly scattered to be able to overtake it. On the former description of land vegetation is either altogether wanting or very stunted; on the latter, it is usually of the most magnificent description, the surface being either covered by dense forests or spread out in boundless prairies of the richest verdure. The principal cultivated crops are the following: wheat, grown in all states, but especially in Minnesota, Kansas, S. Dakota, Nebraska, N. Dakota, California, Missouri, Pennsylvania, Texas, Illinois, Iowa, Washington, Oregon, Maryland, Kentucky, Wisconsin, Tennessee, and Oklahoma; maize, grown throughout the whole country, but chiefly in Iowa, Illinois, Kansas, Nebraska, Missouri, Ohio, and Indiana; oats, increasingly important, confined to the north, cultivated chiefly in Iowa and Illinois; barley, of importance only in New York, Wisconsin, Minnesota, and Iowa; a minor crop of the north-eastern states; buckwheat, mostly in New York and Pennsylvania; cotton, the staple of the southern states, especially of Texas, Georgia, Mississippi, Alabama, S. Carolina, Arkansas, Louisiana, and N. Carolina; tobacco, raised in most states, but chiefly in Kentucky, Virginia and W. Virginia, N. Carolina, Ohio, Pennsylvania, Maryland, and Louisiana; rice, only in the south and mostly in the Carolinas, Georgia, and Louisiana; cane-sugar in Louisiana and Texas; beet-sugar in California, Nebraska, and Utah; sorghum-sugar in Kansas; maple-sugar in the north-eastern states; potatoes, chiefly in the northern states; sweet-potatoes, almost wholly in the south. Of fruits, apples, pears,

and plums are cultivated in the north; peaches farther south; oranges in Florida, California, &c.; grapes in California, New York, Ohio, &c.; lemons, pine-apples, and bananas in the south. Wine is made in California and other states. The following table shows the amount of the agricultural produce of the United States in 1874 and 1900:—

Crops.	Estimated Produce.	
	1874.	1900.
Indian corn, ..... bushels,	850,148,000	2,105,103,000
Wheat, .....	305,000,000	552,230,000
Oats, .....	240,369,000	800,126,000
Potatoes, .....	105,981,000	210,927,000
Barley, .....	32,552,000	58,926,000
Cotton, .. bales of 450 lbs.	8,748,000 (1899)	9,142,838
Tobacco, .....	200,000,000	696,655,752

The domestic animals are the same as those of Europe. Great attention is bestowed on dairy-farming. Hogs, in various improved American breeds, are reared in enormous numbers. The total live stock as estimated in 1900 numbered 13,537,500 horses, 43,902,500 cattle, 41,883,065 sheep, over 60,000,000 pigs, and 2,088,000 mules. Among wild animals the bison or buffalo, which formerly roamed in countless herds over the vast prairies, is now almost extinct; the other more remarkable animals are the moose or American elk, the prong-horned antelope, the panther or puma, the black and the grisly bear, the raccoon, opossum, beaver; birds in almost endless variety; serpents, including the deadly rattlesnake; and alligators in the southern waters.

**Manufactures.**—During the second last decade of the nineteenth century the United States passed ahead of Britain as a manufacturing nation, and it is now the leading manufacturing nation of the world. Although more persons are employed in or supported by the agricultural industries than by the manufacturing industries, the value of the product is much greater for the latter than for the former. The development of United States manufactures has been largely aided by the national protective policy, but this policy must also be held to a great extent responsible for the extraordinary development in that country of the manufacturing combinations or amalgamations known as *trusts*. From 1850 to 1890 the capital employed in manufactures increased nearly thirteenfold, the number of hands employed fivefold, the wages paid nearly tenfold, the gross product more than ninefold, and the net product ninefold. The population in 1890 was about 2½ times that of 1850. In 1850 the average capital per manufacturing establishment was about £800, in 1890 about £3000; the number of employees per establishment, owing to the development of machine industry, also considerably increased; and the average annual wages per employee increased during 1850-90 from about £50 to nearly £100. By far the greater part of the manufacturing industry of the country is carried on in the North Atlantic and North Central States, and in these the establishments are mainly located in large cities. Following is a list of the chief manufacturing industries, with some indication of the chief centres: lumbering, especially in Minneapolis, Bay City, Saginaw, Muskegon, La Crosse, Oshkosh, and elsewhere in the same region; slaughtering and meat-packing, notably in Chicago, Kansas City, and Omaha; flour-mills, especially in Minneapolis; clothing, principally in New York, Philadelphia, Chicago, Cincinnati, Boston, Baltimore, and Rochester; iron and steel, chiefly in Pittsburgh, Allegheny, Chicago, Cleveland, Youngstown, Scranton, and Birmingham; iron and steel manufactures, especially in Philadelphia, Chicago, New York, Pittsburg, Pro-

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vidence, St. Louis, Cincinnati, Cleveland, Buffalo, Worcester, and Erie; carpentering and furniture-making, chiefly in the great lumbering region, the latter especially in Grand Rapids; printing and publishing, especially in New York, Philadelphia, and Chicago; cotton goods, especially in the New England towns of Fall River, Lowell, New Bedford, Manchester, Lawrence, Holyoke, Lewiston, Lincoln, Pawtucket, and Woonsocket, and also in Newark, Augusta, and Atlanta; rubber clothing in Chelsea; boots and shoes, especially in Lynn, Haverhill, and Brockton; tobacco, notably in Richmond, Petersburg, Lynchburg, Wheeling, Durham, and Key West; railroad cars, chiefly in Detroit, Michigan, and Pullman; locomotives mostly in Philadelphia; wagons, chiefly in Racine, South Bend, and Moline; masonry; malt liquors and distilled liquors, everywhere, the former notably at Milwaukee; leather; woollen goods, especially in Philadelphia, Providence, Lawrence, and Lowell; sugar-refining; silk, chiefly at Paterson; petroleum-refining, mainly at Philadelphia and Cleveland; agricultural implements, especially in Chicago, Springfield (Ill.), Akron, Canton, and Auburn; hosiery; paper; chemicals; carpets; and pottery, notably at Trenton.

**Trade.**—In the value of its exports the United States is now on a par with Britain; and in the value of its imports it is surpassed only by Britain, Germany, and France. Of the imports about one-third (in value) represents raw materials, nearly one-fourth food-stuffs and animals, rather under one-seventh luxuries of various kinds, and the rest almost wholly articles partially or wholly manufactured. Manufactured goods account for almost thirty per cent of the total value of exports, agricultural products for nearly sixty-five per cent, forest products for nearly four per cent, mineral and fishery products for the bulk of the remainder. The principal articles of export are: cereals, raw cotton, provisions, iron and steel and manufactures of iron and steel, mineral oils, copper and copper manufactures, machines and instruments of many kinds, timber and wood manufactures, animals, tobacco and tobacco manufactures, leather and leather goods, cotton manufactures, coal, oil-cake, vegetable oils, chemicals, &c., fruits, paraffin, seeds, fertilizers, carriages, cars, &c., paper, fish, furs, sugar, and cycles. The chief articles imported are: sugar, hides and skins, chemicals, &c., coffee, raw silk, cotton manufactures, india-rubber and gutta-percha, hempen, jute, and similar manufactures, silk goods, hemp, jute, and other fibres, timber, iron and steel manufactures, raw wool, fruits, tin, woollen manufactures, tobacco and tobacco manufactures, precious stones, copper and copper manufactures, leather and leather goods, spirits, &c., furs, tea, earthenware and other pottery, raw cotton, fish, oils, toys, cocoa, glass and glassware, animals, coal, and paper.

A view of the trade of the United States for the years 1870, 1895, and 1901 is shown in the following table:—

Years.	Imports.	Exports.
1870.....	£92,475,517	£105,903,860
1895.....	152,493,750	165,290,200
1901.....	171,494,200	304,263,085

The value of the gold and silver bullion and specie imported in 1901 was over £21,500,000, while the value of the domestic bullion and specie exported amounted to nearly £24,500,000.

The commercial intercourse of the United States with Great Britain is shown in the subjoined statement, which gives the total value of the exports of merchandise (exclusive of bullion and gold and silver specie) from the United States to Britain, and the

imports of British produce and manufactures into the United States in 1879, 1895, and 1901:—

Years	Exports.	Imports.
1879.....	£91,818,295	£20,821,990
1895.....	86,548,880	27,945,112
1901.....	141,015,466	18,898,983

Chief among the articles exported to Britain is raw cotton, the export of which in 1901 was valued at £32,355,712; next come grain and flour, £31,378,150; bacon and hams, £13,465,667; oxen and bulls, £7,317,221; fresh beef, £6,761,587; wood and wood-work, £4,817,917; tobacco, manufactured and unmanufactured, £3,786,238; leather and leather goods, £3,786,628; petroleum, £3,472,354. The principal imports of British home produce in the same year were: cotton goods, £2,640,835; linen goods, £2,638,397; iron, wrought and unwrought, £1,448,416; jute yarn and manufactures, £1,133,357; woollens and worsteds, £1,128,288; skins and furs, £809,204; machinery and mill-work, £565,277. The value of the foreign and colonial merchandise sent from Britain to the States was £19,257,267, including especially tin, raw cotton, wool, copper, goat-skins, jute manufactures, hemp, and caoutchouc. The international commerce of the United States is at present mainly carried on in foreign bottoms, which convey about 80 per cent of the aggregate imports and exports. Previous to the year 1856 from 75 to 80 per cent of the foreign commerce was carried by vessels belonging to the United States. Of late years, however, there has been an increase in the total strength of the commercial navy of the United States, as is shown by the following statement of the number and tonnage of the sailing and steam vessels together in 1873, 1897, and 1901 (including canal boats and barges):—

Year.	Number.	Tonnage.
1873.....	14,448	2,301,571
1897.....	22,638	4,769,020
1901.....	24,067	5,524,218

The recent purchase of British Atlantic steamship lines may turn out to have important consequences.

The share of American and foreign vessels in the trade for 1901 is shown as follows:—

	Entered.		Cleared.	
	Number.	Tonnage.	Number.	Tonnage.
American vessels..	13,758	6,381,305	18,602	6,417,347
Foreign „ „	20,759	23,896,716	20,620	23,402,546
Total foreign trade	34,517	29,768,021	34,222	29,819,893

The total burthen of the vessels engaged in the coasting trade was 4,582,045 tons.

The internal commerce of the country, greatly facilitated by the unrivalled natural highways in the shape of navigable rivers and lakes, has been further immensely extended by the construction of canals and railways. The railway system is the most gigantic in the world, there being now nearly 200,000 miles in operation, or nearly nine times the mileage of the United Kingdom. The telegraphs are largely in the hands of the Western Union Telegraph Company, which had in 1901 193,589 miles of line, 972,765 miles of wire, and 23,238 offices; the number of messages transmitted in 1901 was 65,657,049. The Postal Telegraph Cable Company had in the same year 26,349 miles of line, and 184,232 miles of wire, and transmitted 17,898,073 messages. The total length of telegraph lines open for business is about 240,000 miles, besides railway, government, and private lines. There are nearly

2,000,000 miles of wire erected for telephone use. The postal business for the year 1901 was as follows:—The number of letters, &c., handled was 14,181,224,420; and the number of registered packages was 19,446,064. The total value of the money orders issued was over £30,000,000.

*Weights and Measures, Currency, &c.*—The weights and measures are the same as those of Great Britain; but the old Winchester wine gallon, equal to .833 of an imperial gallon, and ale gallon, equal to 1.01695 imperial gallon, and the Winchester bushel, equal to .9692 of an imperial bushel, are used instead of the imperial standards, and a quintal of 100 lbs. is used instead of the cwt. Accounts are kept in dollars = about 4s. sterling, cents or hundredths, and mills or thousandths of a dollar. The currency is partly in paper and partly in specie, both of equal value. Gold is coined in double eagles = 20 dollars, eagles = 10 dollars, half-eagles, and quarter-eagles. Silver is coined in dollars, half-dollars, quarters, and dimes or 10 cents. Silver coins of 20 cents, 5 cents, and 3 cents are also current, but no longer coined. Formerly there was a silver trade-dollar coined to compete with the Mexican dollar, and from 1849 to 1890 a gold dollar was coined. There are also 5-cent pieces in nickel, and cent pieces in bronze.

*Constitution, Government, &c.*—The United States is a federal republic, its government being based on the constitution of 1787. It has been partially modified by subsequent amendments, but remains essentially the same. Each state maintains its independence, and by means of a state legislature and executive has complete management of its own affairs; but the combined states, considered as a Union, have one supreme legislature, which takes the name of Congress, and consists of a Senate and House of Representatives. The Senate consists of two members from each state elected by its own legislature for six years, one-third of the whole body being renewable biennially. Senators must be resident in the state which chooses them, citizens of the United States of nine years' standing, and at least thirty years of age. The House of Representatives consists of members chosen biennially by the people of the several states, in numbers proportioned to their population as ascertained by a decennial census. Each state appoints at least one representative, Pennsylvania having now 30 representatives, and New York 34. It was settled by law, after the results of the census of 1890 had been ascertained, that the House of Representatives should be composed of 357 members, or one member to every 173,900 inhabitants. Representatives must be resident in their electing states, citizens of the United States of seven years' standing, and at least twenty-five years of age. In addition to the representatives from the states, the house admits a 'delegate' from each organized territory, who has the right to debate on subjects in which his territory is interested, but is not entitled to vote. The salary of a senator, representative, or delegate, is 5000 dollars, with travelling expenses. No senator or representative can, during the time for which he has been elected, be appointed to any civil office under authority of the United States which shall have been created, or the emoluments of which shall have been increased, during such time, and no person holding any office under the United States can be a member of either house during his continuance in office. Congress meets at least once a year, and on the first Monday of December, unless otherwise specially provided by law. Its leading powers are to levy taxes, duties, imposts, and excises, to pay the debts and provide for the common defence and general welfare of the Union, to regulate commerce with foreign nations

and among the several states, to coin money, declare war, raise and maintain an army and navy, &c. To secure the general control of Congress it is provided that no state shall enter into any treaty, alliance, or confederation, coin money, or make anything but gold and silver a legal tender, make any law impairing the obligation of contracts, levy duties on imports and exports, except with the consent of Congress and for the use of the United States' treasury, keep troops or ships of war in time of peace, or enter into any agreement or compact with another state or with a foreign power. The executive is vested in a president chosen for four years, but re-eligible indefinitely, by the ballot of an electoral college. This college is peculiarly formed. None of its members can be either a senator or representative in Congress, or in possession of any office of profit or trust under the general government. Each state, in such manner as its legislature may provide, chooses as many electors as it sends senators and representatives to Congress. The president and vice-president are chosen by the majority of these electors; in the case of an equality of votes the president is chosen by the House of Representatives and the vice-president by the Senate. The only important restrictions are, that in this the House of Representatives votes not by a majority but by states, each state having a single vote; and that the election both of president and vice-president must fall on one or other of the three candidates who received the greatest number of electoral votes. The president, who must be a native-born citizen, thirty-five years of age, and resident in the United States for fourteen years, is commander-in-chief of the army and navy, and has the power, in concurrence with two-thirds of the senate, to make treaties, appoint civil and military officers, levy war, conclude peace, &c. He has even a veto on the laws passed by Congress, at least until such time as the same law, when again brought under consideration, has received the assent of two-thirds of both houses. The salary attached to this office is 50,000 dollars a year. The vice-president, who is granted a salary of 8000 dollars a year, presides in the senate, acts for him in cases of temporary disability, and, in case of death or permanent disability, succeeds him for the whole period of his office which was unexpired. By a law which came into force in 1886 the secretary of state, and after him, in the order of the establishment of their departments, the other members of the cabinet, shall act as president in case of the removal, death, resignation, or inability of both the president and vice-president. The business of the executive is administered by the cabinet, a body consisting of eight principal officers—the secretary of state, secretary of war, secretary of the navy, secretary of the treasury, post-master-general, secretary of the interior, attorney-general, and secretary of agriculture. Each of these has a salary of 8000 dollars per annum. All hold office under the will of the president. The judicial powers of the union are vested in a supreme court presided over by a chief-justice and eight associate judges, and such other inferior courts as Congress may from time to time establish. These inferior courts consist at present of circuit-courts and district-courts, the former held by a justice of the supreme court and a district-judge conjointly, and the latter by a district-judge alone. All these judges hold their office during good behaviour, and are removable only on impeachment. Each state administers justice by its own judges, many of whom owe their appointments to the suffrages of the people, and hold them only for limited periods. No religious test is required as a qualification to any office or public trust under the United States. The constitu-

tions of the several states agree in all their essential features, and the modes of administration are virtually alike. The executive of every state is vested in a governor, whose duties are in general analogous to those of the president.

**Finance.**—The general government derives its revenues, almost without direct taxation, from customs, internal duties, and miscellaneous sources. In 1850 its public debt did not amount to £14,000,000 sterling. The debt increased enormously during the civil war, reaching in 1865 the amount of £558,873,546. The following table gives a view of the revenue, expenditure, and debt in recent years:—

Year ending June 30.	Revenue.	Expenditure.	Debt.
1879....	£57,047,330	£55,614,142	£467,811,450
1891....	78,526,223	73,154,781	322,124,024
1896....	65,395,240	71,502,600	368,968,068
1901....	122,434,446	106,243,198	446,526,445

**Army and Navy.**—By the constitution of the United States, Congress is empowered to 'raise and support armies'. The Army Act of 1901 fixed the maximum enlisted strength at 100,000. The term of service is three years. The army as now organized consists of 15 regiments of cavalry; 80 regiments of infantry; a corps of artillery; three battalions of engineers; &c. Certain regiments are composed of negro soldiers commanded by white officers. Each state is supposed to have a militia in which all able-bodied men between the ages of eighteen and forty-five are enrolled, but this scheme is imperfectly carried out. The territory of the Union is divided into eight military departments, namely, East, Missouri, Texas, California, Dakota, Platte, Colorado, and Columbia. The navy in 1902 consisted of twelve battle-ships (seven first-class), three coast-defence ships, eleven armoured cruisers, nineteen other cruisers, twenty gun-boats, thirteen destroyers, thirty-two torpedo-boats, and four submarines; besides vessels building or projected. The United States possesses nine dockyards—Portsmouth, Boston, Brooklyn, Washington, Norfolk, Pensacola, Mare Island, League Island, and Puget Sound; and there are naval stations at New London, Port Royal, and Key West. In the budget of 1900–1901 the estimated expenditure on the army was set down at £30,128,000; on the navy at £12,800,000.

**People.**—With regard to nationality the people are very much mixed. The constant and extensive immigration of the past sixty to seventy years has considerably modified the character of the population sprung from the first colonists. The puritan type of the New England States, which were colonized by the co-religionists of Cromwell, has not yet, however, disappeared. In Maryland the descendants of the English Catholics who immigrated with Cecil Calvert still form one of the principal elements of the population. New York was first colonized by Dutch; Delaware and New Jersey by Dutch and Swedes; Pennsylvania by English Quakers, and subsequently by Germans, who now form a numerous class of the population; Virginia was colonized by English cavaliers; North Carolina by nonconformists; South Carolina, in a great measure by Huguenots. Louisiana at the time of its annexation was mostly peopled by French families. Spaniards are still numerous in New Mexico, Texas, and California; the last-mentioned state contains, besides, a great number of Chinese. The total number of Chinese in 1890 was 107,475. One important element in the population is formed by the negroes, or persons of African descent. The census of 1880 returned them at 6,580,793, that of 1890 at 7,470,040, 6,337,980 being 'blacks'. The aborigines are dying out; a portion of them still live a nomadic

and savage life, while others are settled and partially civilized, and in the Indian Territory manage their own affairs.—Between 1820 and 1901 (June 30) 19,986,818 immigrants entered the States. The total number of immigrants in 1901 was 487,918, of whom 135,996 were from Italy, 113,390 from Austria-Hungary, 85,257 from Russia, 45,564 from the British Isles, 39,234 from Sweden, Norway, and Denmark, 21,651 from Germany, and 3150 from France.

*Education and Religion.*—There is no uniform system of national education throughout the United States, the organization and management of the 'common' or free and state-supported schools being left to each state, while considerable control is also given to the local authorities. These common schools, which in rural neighbourhoods are called district schools, are usually public elementary schools, but in some states they include the higher grades. To support these schools the government makes no direct appropriation of moneys, this being supplied by each state through the state legislature directly, or from local taxation, or the sale of public domains (allotted by the federal governments), the proceeds being set apart as a permanent school fund. Attendance on elementary schools is compulsory in many of the states, but not in all, the compulsory age being between 7 or 8 and 12 or 14. The secondary schools are commonly known as grammar-schools and high-schools. There are also many private elementary and secondary schools. In 1899-1900 the total number of pupils enrolled in the public schools was 15,341,377, of ages varying from 4 to 21; in similar private schools, 1,429,741. At the census of 1890, out of a total population above ten years of age of 47,413,559, 6,324,702 were returned as unable to read and write. This is a percentage of 13.3, but it shows a considerable improvement since 1880, when the percentage of illiterates was 17. Among the native white population over ten years of age only 6.2 per cent are illiterate, among foreign whites the percentage is 13.1, and among the coloured population it is 56.8. Superior education is provided for in colleges and universities, which number 480 in all, with 83,218 pupils, the older universities of Harvard and Yale being amongst the chief of these institutions. There are also numerous special schools and colleges, such as Indian schools, normal schools, schools of science, theology, law, and medicine, industrial and manual training schools. The constitution of the States grants perfect equality to all creeds and religions. The membership of the chief religious bodies in the United States is given for 1890 as follows: Methodists of all sects 4,980,240 (the Methodist Episcopal Church including 2,240,354, the Methodist Episcopal Church, South, 1,209,976); Baptists, 4,292,291; Presbyterians, 1,278,815; Lutherans, 1,086,048; Disciples of Christ, 641,051; Congregationalists, 512,711; Episcopalians, 480,176; German and Dutch Reformed Church, 296,988; Friends, 107,208. The Roman Catholics claim a total of 6,250,045 adherents or members in 1890. There were in 1880 in all 86,132 churches belonging to the various Protestant bodies, and 5975 Roman Catholic churches; 70,864 Protestant ministers, and 6366 Roman Catholic clergy. The other chief sects remaining to be mentioned are the Mormons, with 144,352 members (in 1890); the Universalists, Unitarians, Jews, Swedenborgians, Shakers, &c.

*History.*—The first English colony within the limits of the Union was settled in Virginia in 1607. It was placed under the command of Captain Newport, but its master-spirit was the celebrated John Smith. The expedition was sent out by two merchant companies, called the London Company and the Plymouth Company, and consisted of only 100 individuals, who

were soon reduced to a third of their number from disease and scarcity of food. A new colony, sent out in 1609, proved equally unfortunate, but other settlers continuing to arrive, a better footing was ultimately obtained, and a colonial assembly was for the first time convened in June, 1619. The August following a Dutch war-ship entered James River and sold twenty negroes to the settlers, thus introducing slavery into the colony; and two years later the cultivation of cotton was commenced. The foundation of the colonies of New England was laid by the 'pilgrim fathers,' a body of Puritans numbering 100 who sailed from England, 6th September, 1620, in the *Mayflower*, a ship of 180 tons, and landed 21st December, at a harbour in Massachusetts Bay, where they founded the town of New Plymouth. The neighbouring colony of Salem was founded in 1628, and in 1630 840 additional emigrants settled Boston. Unfortunately the conduct of these new settlers was very inconsistent. While claiming unlimited religious freedom for themselves they denied it to others, and numerous instances of their persecuting tendencies are on record. Rhode Island was first settled at Providence in 1636 by Roger Williams, who had been driven from Massachusetts for maintaining religious and political opinions at variance with those of the rulers of that colony. The states of Maryland and Virginia, colonized chiefly by English Roman Catholics and royalist refugees, were remarkable for the development of an aristocratic and military spirit. The central states were of a more mixed character, having to a great extent been colonized by Dutch and Swedes, who remained in the country after it was ceded to Great Britain. Pennsylvania, colonized by the Society of Friends, long preserved much of the character of its founders, and generally observed a calm neutrality amid the commotions of its more excitable neighbours. But it is impossible to enter into a detail of the origin and progress of the different states now composing the Union. Their early history is merely that of a rising colony occasionally depressed but more generally prosperous, and seldom engaged in transactions which possess much general interest. The most remarkable events were those of the wars which Great Britain and her colonies were obliged to wage with France, and which terminated, as is well known, by the cession of Canada to Great Britain in 1763.

No sooner was this peace concluded than the tranquillity and prosperity which it promised were rudely disturbed by a very harsh, impolitic, and almost infatuated procedure on the part of the mother-country. On March 10, 1764, the British Parliament resolved that it was proper to charge certain stamp-duties on the colonies. This resolution was followed, in 1765, by an act for raising a revenue by a general stamp-duty through all the American colonies. The excitement, opposition, and violent commotions produced by this act led to its repeal in the following year; but the conciliation thus attempted to be produced was completely defeated by a preamble, which asserted a sovereign right in the British Parliament to tax their colonies as they might find expedient. This preamble was not long allowed to remain a dead letter, for in 1767 an act was passed imposing a duty on tea, paper, glass, and painters' colours, introduced into the colonies. The same violent opposition, and the same course of timid and irresolute yet most obnoxious policy, were again exemplified. In 1770 all the duties were repealed except that on tea. The controversy between the mother-country and her colonies involved an important principle, the former asserting her right to tax generally, and the latter denying her right to tax for any but colonial purposes. By retaining the duty



on tea the whole ground of controversy remained as before, and consequently, as might have been foreseen, and was distinctly announced in the almost prophetic eloquence of Burke, the controversy itself raged more fiercely than ever, as if a new element of bitterness had been infused into it. The colonists closed their ports against the articles on which duty was imposed, and in December, 1773, when British ships loaded with tea attempted to effect a landing in the port of Boston, a number of the inhabitants, disguised as Indians, seized them and threw the cargoes into the sea. To punish this defiant deed, Parliament passed the Boston Port Bill, which declared that port closed to all commerce, and transferred the seat of colonial government to Salem. The inhabitants were reduced to great distress, but were everywhere looked upon as the champions of popular rights; Salem refused to become the seat of government, and liberal contributions of money and provisions from the most distant colonies came pouring in to their relief; even in London £80,000 was subscribed in behalf of the proscribed town.

It was evident that a conflict was inevitable, and the colonists began to prepare for war. In Massachusetts nearly every man able to bear arms was trained daily in military exercises and engaged to take the field at a moment's notice. In 1775 hostilities actually commenced. A small British force was sent from Boston, 18th April, to destroy the military stores at Concord, which they effected; but on their return the following day they were attacked by the colonists in some force near Lexington, and forced to retreat, leaving behind them 273 killed and wounded. Before the end of the month the British governor and army were closely hemmed in by Boston by a provincial force of 20,000 men. Elsewhere the colonists acted with spirit; the important northern fortresses of Ticonderoga and Crown Point were seized, and their cannon and ammunition proved of great service in the struggle. A continental congress assembled in May at Philadelphia, and took measures to raise an army and equip a navy. George Washington was unanimously chosen as commander-in-chief, and to furnish him with the sinews of war bills of credit to the amount of \$2,000,000 were issued, for the redemption of which the faith of the united colonies was pledged. On 17th June the British attacked the intrenched position of the colonists on Bunker Hill, which commanded Boston harbour, and captured it, but at a loss of 1054 killed and wounded; the American loss did not exceed 450 in killed, wounded, and prisoners, so that they soon came to look upon the action as a victory. After Washington had spent some time in getting his troops into proper order, he regularly beleaguered Boston till 17th March, 1776, when the British evacuated the town, and sailed for Halifax, carrying away many loyal families. Early in the same winter an expedition was sent into Canada by the colonists, who believed the inhabitants of that province favourable to their cause; but after taking Montreal, and unsuccessfully assaulting Quebec, the remains of the expedition abandoned the British territory in June, 1776. On 7th June Richard Henry Lee, of Virginia, brought before Congress a resolution declaring that 'the united colonies are, and ought to be, free and independent states; that their political connection with Great Britain is, and ought to be, dissolved.' This resolution was passed after an animated debate by nine of the thirteen existing colonies; and Benjamin Franklin, Thomas Jefferson, and others were selected to draft a declaration of independence, which was written by Jefferson and adopted 4th July by the votes of the thirteen colonies, which thus became the United States of America. The British government now began to see that the opposition

was not the ordinary popular outbreak which they supposed it to be. An army of 55,000, including 17,000 German mercenaries, mostly from Hesse-Cassel, under the command of Sir William Howe, was sent into the colonies. The campaign was opened by a battle on Long Island, 27th August, 1776, in which Washington was defeated with heavy loss. He retreated with a disorganized army beyond the Delaware, hoping to save Philadelphia. He was rather listlessly followed by the British, who took unopposed the principal towns of New Jersey as they advanced, but allowed themselves to be surprised at Trenton (25th December), and at Princeton (3d January, 1777). Meanwhile Congress had not been idle; it formed articles of confederation between the states (which were ratified by all except Maryland in 1778-79), and sent Franklin and Silas Dean to France to solicit recognition and aid. Formal recognition was withheld, but money and material were privately sent, and volunteers, such as Lafayette, Pulaski, Kosciusko, Baron Steuben, and Baron Kalb, crossed the Atlantic to fight for the republican cause. The next campaign again opened disastrously for the Americans. Washington, in order to defend Philadelphia, then the capital, was obliged to give battle on the Brandywine, 11th September, to a much superior force, and was completely defeated, and the British entered Philadelphia without further opposition. Fortune, however, smiled upon the Americans in the north. General Burgoyne, with an army of 7000 British and German troops, accompanied by numerous bands of Canadians and Indians, marched from Canada to effect a junction with the British on the Hudson, and to cut off New England from the rest of the confederacy. He was met by General Gates at Stillwater, near Saratoga, where two toughly-contested actions took place (19th September and 7th October), on the whole favourable to the Americans. Having but three days' provisions, he was compelled to capitulate on the 17th October. This event induced the French to enter the struggle in the spring of 1778, and subsequently Spain and Holland joined in the war against England, and aided the Americans. Britain sent fresh armies and fleets to crush the rebellion; but although they gained several victories, it was obvious that the subjugation of the confederates was farther off than ever. At last the surrender of the British general Lord Cornwallis with an army of 7000 men at Yorktown, 19th October, 1781, to a combined French and American force under Rochambeau and Washington, virtually terminated the war. On 3d September, 1783, Great Britain formally recognized the independence of the United States, which now turned their attention to the improvement of their political constitution and social condition.

It was soon felt that the articles of federation adopted in 1778 formed an insufficient constitution for the nation, and that they were especially defective with regard to the subjects of legislation which concerned the whole country, such as the regulation of commerce, the common defence, making treaties with foreign powers, adjusting disputes between the several states, &c. A national convention met at Philadelphia 14th May, 1787, and after four months' deliberation framed a constitution, which is still the basis of the government. It was objected to by many as setting no limits to the federal power; but after a thorough discussion, lasting in some states for two or three years, it was accepted by all of them, first by Delaware in 1787, and lastly by Rhode Island in 1790. When two-thirds of the states had voted for the constitution it was considered valid, and came into operation in March, 1789. New York was chosen as the capital, and there Washington, who was unanimously chosen as first president, was inaugurated 30th April.



The first Congress immediately proceeded to raise a revenue by imposing duties; to establish a federal judiciary, consisting of a supreme court with circuit and district courts; to organize the executive administration by creating the departments of war, of foreign affairs, and the treasury; to fund the debt of the United States; and to assume the heavy war debts of the several states; and to establish a national bank. The jealousy of state rights soon began to manifest itself in opposition to the federal government, and the two parties of federalists and anti-federalists became every day more distinctly marked. Indian hostilities had also required an increase of the military establishment; and the duty on domestic spirits met with such open resistance, that the president issued a proclamation against combinations and proceedings tending to obstruct the execution of the laws.

In 1793 Washington was unanimously re-elected president. An insurrection (the 'Whisky War') in the western counties of Pennsylvania, on account of the duties on domestic spirits, was quelled (1794) without bloodshed, by the prudence and vigour of the executive; and the hostilities with the Indians on the western frontier were terminated by the entire defeat of the savages by General Wayne. Meanwhile the progress of the French revolution had excited a lively interest in America, naturally producing among many a high degree of enthusiasm in favour of the nation which had borne arms in their cause, and was now struggling for liberty. The president was determined to preserve a strict neutrality between the new republic and the other European powers. Citizen Genet, the French minister at New York, fitted out privateers against England, a course which led Washington to demand his recall, and another minister was sent in his place. A treaty of amity, commerce, and navigation which was concluded with Britain, 14th August, 1795, produced so much opposition among the anti-federal or republican party as to put in danger the existence of the government; but public opinion gradually settled in favour of the treaty as the only means of saving the country from becoming involved in the wars of the French revolution. Washington refused to be elected for a third term and vacated the presidential chair 4th March, 1797.

During his administration the states of Vermont, Kentucky, and Tennessee were admitted into the Union. John Adams was elected second president, with Thomas Jefferson as vice-president. The relations between France and America had now become so threatening that Congress convened in extra session resolved to send envoys to France with full power to adjust all difficulties. The French Government refused to receive them, and Congress made preparations for war. An army was organized, and Washington was nominated commander-in-chief; but the actual fighting took place only at sea, where the American cruisers had the advantage in several encounters. The war was terminated in 1800. In the same year the seat of government was transferred from New York to Washington. In 1801 Jefferson became third president. In 1802 Ohio was admitted into the Union, whose territory was more than doubled in the following year by the purchase of Louisiana from the French for \$15,000,000; this gave the States the whole region, 1,000,000 miles in extent, between the Rocky Mountains and the Mississippi, and thus secured the free navigation of that important river.

The Peace of Amiens had for a short period given tranquillity to Europe; but hostilities in which all the powers of that continent were involved were soon renewed; and the United States, being the only important nation which preserved its neutrality, had become possessed of an extensive and lucrative carrying trade. The continental system of Napoleon, and

the counter measures of the British government, directed to the interruption of all commercial intercourse between the respective belligerents and neutrals, led to a series of acts which threatened the entire destruction of American commerce. In addition to the depredations committed by the two powers, Great Britain also claimed the right of searching American vessels, and impressing from them British seamen. The British frigate *Leopard* stopped the United States frigate *Chesapeake* in June, 1807, near the entrance to Chesapeake Bay, and demanded four of her men, alleged to be British subjects; on a refusal being given, the *Leopard* fired into her, killing and wounding twenty-one of her crew. The surprised *Chesapeake* struck her flag, and four men were taken from her, three of whom were afterwards proved to have been natives of the States. Some time later all trade and intercourse with France and England was prohibited by act of Congress, and in June, 1812, war was declared against Britain. This war continued with varying success for three years, during which the Americans made a vain attempt at the conquest of Canada, and the British were repulsed in several attacks on the maritime towns. In the numerous sea-fights that took place the Americans had generally the advantage, but the tide of success seemed turning when peace was concluded in December, 1814.

The main subsequent events up to the great civil war are the wars against the warlike southern Indian tribes and the acquisition of Florida from the Spanish in 1819; the annexation of Texas, which led to a war with Mexico, in 1845; and the acquisition of New Mexico and Upper California, which were ceded to the United States on the payment of 15,000,000 dollars to Mexico along with some claims of American citizens against Mexico.

The period in and about 1857 was an anxious and agitating one for the United States. The dissensions between the various states were becoming serious as their interests became more directly affected. One cause of dissension was the duties levied on foreign manufactures, which were so high as to act as protective duties in favour of the manufacturing states, and in the same degree prejudicially to the agricultural states of the west and the tobacco and cotton-growing slave states of the south. There were also other causes of dissension. The Northern States were desirous of confining the area of slavery, the Southern States were resolutely bent on extending it. They had introduced Texas into the Union as a slave-holding state, and the endeavour to act similarly with regard to the territory of Kansas led to what was a civil war on a small scale—Kansas remaining a territory, and not a state, because it refused to admit slavery as a part of its constitution. The question was still further complicated by disputes respecting the territory of Nebraska. During the years of Buchanan's presidency (1857–61) all these questions were discussed with increasing bitterness and earnestness, to which an attempt of John Brown, in October, 1859, to raise the slave population against their owners, added force. Brown was executed, but the slave-owners were still in dread of the 'Abolitionists.' When the time for the election of a president in succession to Buchanan approached, and it became apparent that the candidate of the Northern States would be victorious, South Carolina was foremost in declaring its determination to secede from the Union if that were the case. To pacify the dissatisfied states Buchanan in December, 1860, proposed certain amendments in the constitution, but without avail. On December 20th South Carolina formally seceded from the Union, and was followed in quick succession by North Carolina, Mississippi, Florida, Alabama, Georgia, Louisiana, Tennessee,

Virginia, Texas, and Arkansas. After a hot contest the North carried the election of Abraham Lincoln as president. The seceded states, with those that subsequently joined them, formed themselves into a Southern Confederation (4th February, 1861), with Jefferson Davis and Alexander H. Stephens for president and vice-president. The custom-houses, arsenals, and United States buildings generally were seized and occupied by Confederate officers, and every preparation made to organize a separate government. Defections of officers and men, naval and military, and of other public servants of the Union, took place far and wide; and a very large volunteer army was speedily in readiness to maintain the independence of the seceded states.

At the time of the outbreak the United States army consisted of only 14,000 regular troops, scattered over the country in all directions; and the navy numbered only 5000 seamen, in all parts of the world. The troops in garrisons in the Confederate States either surrendered or joined the Confederate cause. The garrison, however, at Charleston, in South Carolina, was an exception, for, taking possession of Fort Sumter, under Major Anderson, this small body of troops determined to make a stand. Here the first blow was struck on April 12, 1861; the Confederates proceeded to bombard the fort, which, after thirty-two hours' resistance, was forced to surrender, without a life being lost on either side. This episode aroused the North to active measures. The president called out by proclamation 75,000 volunteers, who were soon organized into an army. Hostilities commenced in Virginia, the Federal General Butler being defeated at Big Bethel in the east, and McClellan being successful in the west. But the first action on a large scale took place at Bull Run, about 25 miles south of Washington, between the newly levied Federal army of 50,000 men under General McDowell and the Confederate army of 30,000 men under General Beauregard. During the action a panic seized the Federal troops, and a most disorderly retreat at once commenced, the men throwing away their arms and accoutrements and hurrying back terror-stricken to the capital. General Beauregard did not follow up his advantage; and the president of the Northern States immediately prepared to repair the disaster, and took far larger measures by calling out two levies successively of 500,000 each. During the remainder of 1861 frequent collisions took place between the rival forces at different points, almost always to the disadvantage of the North, so much so that at the close of the year the Federals had possession of very few places in the seceded territory. In the following spring of 1862, however, besides the capture of Fort Donnellson, on the Cumberland River, by General Grant, the same commander obtained a signal victory over the Confederates at Pittsburg Landing, in Tennessee. The naval operations comprised the capture of Roanoke Island, and of Forts Pulaski and Maceon by the Federals, and engagements on March 9th and 10th in Hampton Roads, in the James River, in which the *Merrimac*, an iron-clad steam ram, made great havoc of the Federal fleet, but on attempting to renew her attacks the next day was encountered by the *Monitor*, a Federal iron-clad turret ship, and obliged to retire. On April 28th the Federal fleet, under Admiral Farragut, having passed the forts at the entrance of the Mississippi, below New Orleans, that city was evacuated by the Confederates, after burning vast quantities of cotton and other property, and formally surrendered to the Northern forces. An attempt was then made by General McClellan to invest Richmond, the capital of the Confederacy, from the peninsula between the York and James Rivers; the Federal lines were

established along the Chickahominy, within sight of the capital. But after a determined onset by the Confederates under Generals Lee and 'Stonewall' Jackson, maintained for several days, the Northern army was driven back to the James River and the shelter of the gunboats. The Southern forces under General Jackson then turned northward, and repulsed with great energy and success a Federal army under General Pope, which was pushing on with some hardihood without a base of operations. General Lee then assumed the offensive and threatened Washington, necessitating the recall of McClellan from the James River for the defence of the Northern capital. After a successful engagement with the advanced guard of the Confederates at South Mountain, and a second and obstinate fight on the banks of the Antietam, which, however, was attended with no decisive result, the Federals had the satisfaction of seeing the Confederates recross the Potomac. In the meantime the Federal General Rosecrans obtained advantages in the north of Mississippi, and elsewhere the Northern forces had success. After a pause McClellan was superseded by Burnside, and in December another advance to Richmond was commenced; this General Lee had anticipated, and intrenched himself behind the town of Fredericksburg, south of the Rappahannock. The Federals attacked this position with immense energy, but could make no impression upon it; and at last, baffled and demoralized, they were forced to recross the Rappahannock, to the great consternation of the North. The year 1862 thus closed with no material progress made on either side, but with heavy losses and disasters to both combatants in turn.

The first days of 1863 were signalized by a struggle prolonged over three days at Murfreesboro, in Tennessee, at the close of which the Confederates fell back defeated. At the end of April General Hooker, superseding Burnside in the command of the army of the Potomac, commenced another movement towards the Confederate capital, and crossing the Rappahannock some distance above Fredericksburg thought to turn the left of Lee's army. Lee, however, despatched 'Stonewall' Jackson to intercept this movement, and so suddenly and impetuously was this effected, on two successive days, near Chancellorsville, that Hooker with difficulty saved his army from total defeat. This done Lee turned back and drove a Federal force out of the position at Fredericksburg which he had just left and they had occupied. The success at Chancellorsville was attended with irreparable loss to the Confederates in 'Stonewall' Jackson, who was mortally wounded by a chance shot from his own division. Flushed with this success General Lee transferred his army to the valley of the Shenandoah, entered Maryland, and crossed into Pennsylvania; but at Gettysburg he was obliged to turn upon the Federals under Meade, their new commander, who were following him. On the first three days of July prolonged and desperate encounters took place between the two armies; on the third the Confederates, with whom the balance of advantage thus far rested, prepared for a grand and desperate attack upon the high ground on which the Federals were posted, but Meade bringing up his reserves the almost superhuman efforts of the Southern army were of no avail, and the battle ended in favour of the North. Lee slowly retreated into Virginia, having lost nearly 15,000 men of the flower of his army in a week's fighting. On the Mississippi the fortune of war was also in favour of the Federals. Vicksburg and Port Hudson were the strongholds of the Confederacy in this direction. Against the former General Grant commenced operations in the beginning of 1863, but was unsuccessful until Admiral

Farragut with his fleet dashed past the batteries of Port Hudson, as he had done at New Orleans, captured Natchez, drove away the Southern fleet, and effected a junction with Admiral Porter below Vicksburg. Grant suddenly resumed the offensive, and after failing to carry the place by storm, at last, in conjunction with the fleet, reduced it by regular siege to a surrender on July 4th. Soon after the whole length of the Mississippi was in the hands of the Federals. In the spring a Federal iron-clad fleet bombarded Charleston and was signally repulsed; in July a bombardment of Fort Sumter and the other forts was commenced by a land force, but an attempt to capture Sumter, which had been battered to pieces, by assault, was unsuccessful. In September the Federals were beaten on the banks of the Chickamauga, and under Rosecrans fled in total rout to Chattanooga, in Tennessee, where they were beset by the Confederates posted on Lookout Mountain and Missionary Ridge. Grant replaced Rosecrans, and having received large reinforcements, prepared for a grand sortie on November 25th. On that day a vast army issued from the besieged town, drove the Confederates from Lookout Mountain into the valley behind, one division with some difficulty also dislodging the Confederates from Missionary Ridge. The Southern army fled wildly from the field of battle, and left the Federals masters of the situation.

In the early months of 1864 numerous engagements took place in various directions, resulting for the most part in Confederate success, but having little influence upon the issue of the conflict. The chief interest now centred in the army of the Potomac, over which Grant was appointed commander-in-chief, and which he at once set himself to reorganize. In May he moved his main force across the Rappahannock against Lee, who awaited him on the south bank. A co-operating column advanced down the Shenandoah, while Butler with a large force moved up the James River towards Richmond. On May 6th the fighting began at the Wilderness, and lasted throughout the 6th, 7th, 8th, 9th, 10th, and 11th, Grant displaying marvellous tenacity and fertility of resource, and Lee exhibiting surpassing skill in baffling every attempt of his antagonist. Unable to rout the Confederates, Grant endeavoured by a flank movement to cut them off from Richmond, but Lee anticipated the attempt and foiled it. This was repeated again and again, till, reaching the Chickahominy, Grant dashed upon the Confederate lines, but so deadly was the Southern fire, that in ten minutes the assailants were totally repulsed. Thus baffled, Grant by a circuit crossed the James River, joined Butler, and attacked Petersburg, but was repelled, and obliged to begin a regular siege. Thus relieved from immediate attack, Lee despatched Ewell against the Shenandoah army, which he defeated, marched up to the very walls of Washington, and leisurely retired with enormous booty. Meantime Sherman, with a large Federal force in Georgia, after much successful fighting and excellent strategy, reached Atlanta, and forced the Confederates to evacuate it. Admiral Farragut, too, executed another dash, passing the forts at the entrance of Mobile Bay, and with wooden vessels compelled the iron ram *Tennessee* to surrender. Grant having failed in two assaults upon Petersburg, endeavoured to cut off its communications with the South, and established himself strongly on the Weldon Railroad. On November 14th Sherman abandoned Atlanta, and after several weeks of public uncertainty as to his course he reappeared on December 14th before Savannah, which, Fort M'Alister being taken by storm, was shortly after abandoned by the Confederates. In the middle of January, 1865, Sherman advanced with the main

column of his army towards Charleston, which was evacuated in the night of February 17th, and entered by the Federals the next day; and on the 22d Wilmington was captured by a combined naval and military force. In the meantime severe fighting had taken place between Grant and the defenders of Petersburg and Richmond; till at length, after three days' sanguinary conflict, the Confederate lines were broken, and Richmond lay at the mercy of the Northern armies. Lee retreated north of the Appomattox, while Grant occupied Richmond and Petersburg on Monday, April 3d, and then followed in close pursuit of Lee, who four days after, seeing that further resistance was hopeless, surrendered with his army as prisoners of war. The remaining Confederate armies in the field soon after surrendered likewise, or disbanded themselves. Thus hostilities ceased, and the four years' war ended in the complete subjection of the Southern States to the Federal government. In the course of the war the total and unconditional abolition of slavery had been proclaimed by President Lincoln, and at the end of it every slave found himself absolutely free.

On April 14th President Lincoln was assassinated in Ford's theatre at Washington by a Southern fanatic named Booth. He was at once succeeded by Vice-president Johnson, who prepared to carry out the wise and moderate measures which Mr. Lincoln had contemplated for the pacification and revival of the exhausted country. As the states returned to their allegiance to the Union, they were re-admitted to their state and national privileges; but soon party spirit in the North began to rise, and in the congressional struggles of the rival Democrats and Republicans the liberties of the Southern States were sorely infringed, and many of the states subjected to the rule of military governors nominated by the Northern cabinet. The restoration of prosperity to the South was thus greatly impeded, and the condition of both negroes and whites became one of great privation. After a time, however, there was an approach to better things, and the work of reconstruction in the Southern States commenced. The first thing was to establish the equality of the suffrage for all, and to invest the coloured population with all civil and equal rights. Congress decreed that 'no distinction should be made between citizens of the United States, either in the exercise of the franchise or in the right to discharge any functions of the state, by reason of race, colour, birth, property, education, or religious creed.' The access of General Grant to the presidency in 1869 served, in some measure, to consolidate matters. A crowd of abuses had invaded the administration, and especially the finances of the state, owing to the disorder produced by the war. Unscrupulous men had got into office, and taken advantage of it to make enormous fortunes in a few months. The gigantic debt that had accumulated in the few years of the war was an apparently unmanageable difficulty. Many people, alarmed at the burden and taxation that the debt would involve, proposed repudiation, or, in other words, an act of national bankruptcy, either by only a partial payment of the state creditors, or by paying them in paper money. But the president announced that 'not a cent of the public debt should be repudiated. The national honour demanded that every dollar borrowed by the government should be repaid in gold.' No difficulty has been experienced in dealing with the debt on this principle, the resources of the country being boundless.

Some years subsequently to the establishment of peace a dangerous storm began to gather in the South. The emancipation of the negroes in the slave-holding states was an unavoidable result of the defeat of their former masters, and the extension of civil

rights to them almost as inevitable. Being led and managed, however, by a host of disreputable adventurers from the North, who soon came to be known by the expressive title of 'carpet-baggers', they possessed themselves of the whole machinery of government, made laws and spent taxes with the reckless gaiety of ignorance. Fierce struggles for power took place, but ultimately by fair and foul means the whites gained the upper hand, and they have so arranged the state machinery that the negroes can never again become masters of the situation.

The Treaty of Washington, signed on May 8, 1871, provided for the settlement by arbitration of three outstanding disputes with Great Britain. One of them concerned the claims based on the depredations of the Confederate vessel *Alabama* (which see); the second, the San Juan boundary question, bore on the disputed boundary between British and United States territory in the neighbourhood of Vancouver Island; and both of these were settled in favour of the United States. The third concerned the Canadian fisheries, and was decided against the United States.

President Grant's policy had alienated many Republicans, but in 1872 he was re-elected by a very large majority, and in 1873 entered upon his second term of office. He made strong efforts to reform the civil service by making the tenure of office and promotion dependent on merit and not on partisanship, but his work in this direction was seriously hampered by the opposition of Congress. The year 1873 witnessed a serious financial and commercial crisis due to the state of the currency and to over-speculation, and in consequence an act was passed which for the first time restricted the free coinage of silver. In 1875 an act provided for the resumption of specie payments on Jan. 1, 1879. In 1876 the centenary of the Declaration of Independence was celebrated by a great international exhibition at Philadelphia. The chief candidates for the presidency at the election of 1876 were Rutherford B. Hayes (Republican) and Samuel J. Tilden (Democrat). The voting was practically equal, and there was some dispute as to the electoral votes of certain southern states. The house was Democratic and the senate Republican, and for a time they could not agree on a method of determining the result. Ultimately the question was referred to an electoral commission consisting of five senators, five representatives, and five members of the Supreme Court, and Mr. Hayes was declared to be elected by a majority of one. President Hayes, who assumed office in 1877, ended the period of reconstruction in the South by withdrawing all federal troops in 1877, and he greatly advanced the cause of civil service reform. Since the passing of the Act of 1873 silver dollars had not been coined, but the Bland Silver Act, passed over the president's veto in 1878, required the treasury to purchase a minimum of 2,000,000 dollars' worth of silver bullion per month for coinage into dollars of 412½ grains, and these dollars were declared an unlimited legal tender. The leading candidates at the presidential election of 1880 were James A. Garfield (Republican) and W. S. Hancock (Democrat). The former was elected, and assumed office in 1881, but he was shot by a disappointed office-seeker in July, and died in September of the same year. His place was taken by the vice-president, Chester A. Arthur, whose administration was uneventful, its principal legislative measure being the Civil Service Act of 1883. In 1884 the Republicans nominated James G. Blaine, and the Democrats, Grover Cleveland, for the presidency, and the latter was elected. President Cleveland used the veto more than any of his predecessors,

and in his message of 1887 declared strongly in favour of a departure from the protectionist policy which had obtained since the Civil War. At the election of 1888 he was beaten by the Republican, Benjamin Harrison, who succeeded him in the spring of 1889. The most noteworthy measure of Harrison's term was the highly protectionist Tariff Act of 1890, generally named after its chief promoter, William M'Kinley. To the same year belongs the Sherman Act, similar to the Bland Silver Act of 1878. The election of 1892 resulted in the defeat of Harrison by Cleveland, who began his second term in 1893. This year was notable for a serious business crisis and the consequent repeal of the purchasing clauses of the Sherman Act, for the great Columbian Exposition at Chicago to celebrate the fourth centenary of Columbus's discovery, and for the submission to arbitration of the dispute with Canada regarding the seal-fisheries in the Behring Sea. Cleveland was supported by a Democratic majority in both chambers, and accordingly he secured the passage of the Wilson Tariff Act of 1894, under which much of the protection of M'Kinley's Act was removed, and a tax imposed on incomes of over 4000 dollars. The Supreme Court in 1895 decided that the income-tax provision was unconstitutional. The great railway strike of 1894 led to riots and the interference of the federal troops; and in the same year there was a serious development of the problem of unemployment. In his message of Dec. 17, 1895, President Cleveland brought his country to the verge of war with Britain by claiming to interfere, on the basis of the Monroe Doctrine (see in SUPP.), in the boundary dispute between Venezuela and British Guiana, but an agreement to submit it to arbitration was come to in the following year. The presidential election of 1896 was an extraordinarily exciting one. The Democratic candidate, William J. Bryan, was a young man of great eloquence, who demanded the free coinage of silver at the ratio to gold of sixteen to one, and accordingly he received the support of the silver-mining and the agrarian interests. He was opposed by the Republican, William M'Kinley, whose defence of 'sound money' and the gold standard gained him the votes of the financial and manufacturing interests. The result was a victory for M'Kinley. Hawaii was annexed in 1897.

The year 1898 is an important date in United States history, for it marks the beginning of American imperialism. The immediate occasion of this movement was the war with Spain, which arose out of the revolt in Cuba. From 1868 to 1878 a large part of the island was virtually independent of Spain under a rebel republican government, and when a fresh revolt broke out in 1895 the insurgents received help from private sources in the United States. When General Campos had failed to re-establish Spanish authority by conciliatory methods he was replaced in January, 1896, by General Weyler, whose brutal policy of devastation and concentration was even less successful. Weyler was recalled towards the end of 1897, and General Blanco was placed in command, an autonomous government being at the same time conferred upon the island. This repentant and liberal policy, however, came too late to save the situation, and the demand for independence grew stronger. The United States was becoming more and more ready to intervene, and the destruction by explosion, on Feb. 15, 1898, of the *Maine*, a United States warship lying in Havana harbour, made war practically certain. A Spanish and an American commission reported on the explosion, the former attributing it to an internal, the latter to an external cause, the suspicion in

America being that guilt attached to Spain. By the intervention of the Pope and the European Powers hostilities were stayed between Spain and the rebels, but before any final settlement was reached, the United States forwarded to Spain a demand for the evacuation of Cuba. While this demand was on its way, the Spanish government broke off diplomatic relations, and from April 21, 1898, there was a state of war between the two countries. Soon after the outbreak of war, Admiral Dewey destroyed the Spanish fleet in the harbour of Manila, in the Philippines, captured the forts at Cavite, and made preparations for reducing Manila itself. Aguinaldo and other leaders in the former rebellion against Spain were brought from Hong Kong, but the capital was not taken till Aug. 13, a day after the peace protocol had been signed. Cuba was meanwhile blockaded by the United States fleet under Admiral Sampson, and on May 19 the Spanish fleet under Admiral Cervera was shut up in the harbour of Santiago. On June 11, Guantanamo was captured, and troops were landed by the Americans, who marched upon Santiago aided by the insurgents. When the outworks of the town had been carried by General Shafter's force, Cervera tried to slip out of the harbour, but all his vessels were sunk or captured. The city and the eastern part of the island were surrendered on July 14. Porto Rico was invaded on July 25 by an American force under General Miles, but on the following day overtures for peace were made by Spain through the French ambassador. The protocol was signed at Washington on August 12, 1898, and the final treaty of peace at Paris on Dec. 10, 1899. Spain relinquished all claim to Cuba, and ceded to the United States Porto Rico and other West Indian islands, Guam in the Ladrões, and the Philippine Islands. A Cuban convention drafted a republican constitution, which was accepted by the United States, subject to certain conditions, constituting a kind of suzerainty, and on Feb. 24, 1902, the first president and vice-president of the new republic were elected. The Filipinos refused to accept the cession of their islands, and formed a republican government with Aguinaldo as president. They have maintained a determined struggle against the American forces, and although their chief leader Aguinaldo has been captured, they are still unconquered. The aim of the Filipinos appears to be to secure a settlement similar to the Cuban one. Disturbances in the Samoan Islands led to the reconsideration of the Act of 1899, under which Britain, Germany, and the United States guaranteed the neutrality and independence of the islands, and by the Anglo-German agreement of Nov. 14, 1899, ratified by the United States in Jan. 1900, Britain retired altogether from the islands, Germany received Savaii and Upolu, whilst the United States obtained Tutuila and the eastern islands. The Dingley Tariff Act, a highly protectionist measure, was passed in 1897.

The candidates at the presidential election of 1900 were again M'Kinley and Bryan, the latter not only demanding the free coinage of silver, but also strongly opposing the expansionist and imperialist movement, and calling for legislation to check the huge industrial combinations known as *trusts*. M'Kinley was again victorious. The United States acted along with the European Powers in the Chinese crisis of 1900. The Isthmian Canal question led to protracted negotiations with Great Britain. The Clayton-Bulwer Treaty of April 18, 1850, guaranteed the neutrality of any canal that might be constructed across the Isthmus of Panama or any Central American state, and placed it under the joint protection of Britain and the United

States. The Hay-Pauncefote Treaty of Feb. 5, 1900, modified this treaty in favour of the United States, but the senate introduced important amendments, which practically meant the abrogation of the 1850 agreement. Ultimately, on Nov. 18, 1901, the Clayton-Bulwer Treaty was superseded by a new Hay-Pauncefote Treaty, giving the United States sole control over any Isthmian canal constructed by it, but securing to Britain equal commercial rights in its use. On Sept. 6, 1901, President M'Kinley was shot by an Anarchist named Czolgoz while attending the Pan-American Exposition at Buffalo, and he died eight days later. The vice-president, Theodore Roosevelt, succeeded him. He has indicated a desire for a relaxation of the protectionist policy in favour of one of reciprocity, and has been bold enough to declare for legislation to control the trusts. In 1902 his intervention ended a great strike in the Pennsylvania anthracite industry. He stands firmly by the Monroe Doctrine as the cardinal principle of America's foreign policy. Negotiations for the purchase of the Danish West India Islands took place in 1902, but the treaty has not yet been accepted by the Danish parliament. Perhaps the most notable feature of the recent history of the United States has been its marvellous industrial development, marked by new phenomena of a perplexing and even dangerous kind. The trusts, such as the huge Steel Corporation, have given rise to much uneasiness even outside of the Union, and in the same connection may be mentioned Mr. Pierpont Morgan's acquirement of an extensive control over some British and other Atlantic shipping companies. In 1902 the United States government made a representation to the European Powers regarding the ill-treatment of Jews in Roumania. An outstanding question between Britain and the Union is that of the Alaskan frontier, which has become of importance since the discovery of gold in the Yukon region.

*Literature.*—The first literary work of any consequence produced in the country was a translation of Ovid's *Metamorphoses* by George Sandys (London, 1626). The first book printed in the colonies was a Puritan edition of the *Psalms* (Cambridge, U.S., 1640), perhaps the worst of all hitherto published English metrical versions. Anne Bradstreet (1612-72), wife of a governor of Massachusetts, wrote a volume of poems (*The Tenth Muse*) which was published in London in 1650. But by far the most notable writers of this period were the theologians, such as Increase and Cotton Mather (1639-1723, 1663-1728), Roger Williams (1604-83), and, above all, the subtle metaphysical Calvinist Jonathan Edwards (1703-58). From the journals and annals of John Winthrop (1588-1649), governor of Massachusetts, Edward Winslow (1595-1655), governor of Plymouth colony, William Bradford (1590-1657), governor of Plymouth, Nathaniel Morton (1613-85), and others, the modern historians of America have derived much valuable information. The career of Benjamin Franklin (1706-90), statesman, philanthropist, and scientist, belongs to the stirring revolutionary era, during which the chief writers were politicians. Among the most noted of these were James Otis (1725-83), Josiah Quincy (1744-75), John Adams (1735-1826), Thomas Jefferson (1743-1826), the eminent writers of the 'Federalist', a series of essays in vindication of the federal constitution published in 1787-88, viz. Alexander Hamilton (1757-1804), James Madison (1751-1836), and John Jay (1745-1829). Local historians were not inactive; the History of Connecticut was written by Benjamin Trumbull (1735-1820), of Massachusetts by Thomas Hutchinson (1711-80) and George R.



Minot (1758-1802), of Pennsylvania by Robert Proud (1728-1813), and of New Hampshire by Jeremy Belknap (1744-98). Histories of a more general scope are those of New England by Hannah Adams (1755-1832), of the American revolution by William Gordon (1730-1807) and David Ramsay (1749-1815), and the *Annals of America* by Abiel Holmes (1763-1837). Among the theologians we can only mention the younger Jonathan Edwards (1745-1801), Samuel Hopkins (1721-1803), Timothy Dwight (1752-1817), Bishop William White (1748-1836), John Murray (1741-1815), and Joseph S. Buckminster (1784-1812). The *Journal of the Quaker John Woolman* (1720-72) was greatly admired by Charles Lamb, Whittier, and other eminent men of last century. The list of poets includes Francis Hopkinson (1737-91), author of *The Battle of the Keys* and other humorous poetical pieces; Philip Freneau (1752-1832), the author of many spirited revolutionary poems; John Trumbull (1750-1831), writer of the satirical *M'Fingal*, a Hudibrastic epic; and Joel Barlow (1755-1812), who composed the dull epic called *The Columbiad*. The first American novelist of note began to write at this period, namely, Charles Brockden Brown (1771-1810).

The number of American writers has enormously increased since the beginning of the nineteenth century, and a few have obtained a world-wide reputation. Nearly all branches of literary art are represented by works of a more or less adequate and characteristic kind, and some new materials and forms, notably the so-called 'American humour', have been added to the Old World stock. Only the briefest summary can be given here, but fuller information may be had from the articles on the chief writers and from special works, such as those mentioned at the end of this article.

The first American writer to become really popular on the European side of the Atlantic was Washington Irving (1783-1859), author of *Knickerbocker's History of New York* (1808), *The Sketch-book* (1820)—containing the famous story of *Rip Van Winkle*), several novels, histories, and biographies. After him came James Fenimore Cooper (1789-1851), who obtained a great reputation by his novels of American Indian and of sea life, such as *The Last of the Mohicans* (1826), *The Pathfinder* (1840), *The Pilot* (1823), and *The Red Rover* (1828). He was far surpassed by Nathaniel Hawthorne (1804-64), one of the most original writers of America, whose greatest works are *The Scarlet Letter* (1850), *The House of the Seven Gables* (1851), and *Transformation* (1860). Henry D. Thoreau (1817-62), author of *A Week on the Concord and Merrimac Rivers* (1849) and *Walden* (1854), stands at the head of a class of writers on nature whose point of view is characteristic of our time. William E. Channing (1780-1842) and Theodore Parker (1810-60) were among the foremost leaders of the liberal movement in theology and religion, as well as in political and social questions, which furnished much of its vitality to the New England literary circle.

At the head of the so-called Transcendentalist group of writers was Ralph Waldo Emerson (1803-82), a man of profound insight, whose influence has been both deep and wide-spread. His best-known works are his *Essays* (1841-44), *Representative Men* (1850), and similar prose writings; but his poems, though often metrically imperfect, are in some respects a truer expression of his genius. In the conduct of *The Dial*, an organ of Transcendentalism, he was associated with Margaret Fuller Ossoli (1810-50) and George Ripley (1802-80), also

known otherwise as authors. Emerson contributed to the *Atlantic Monthly*, which was started in 1857 under the editorship of James Russell Lowell (1819-91), whose fame is securely founded on his admirable essays, his highly idealist and finished serious poetry, and his masterly satirical dialect verses against slavery and the Mexican war, known as *The Biglow Papers* (1848). One of the most notable contributors to the early numbers of the *Monthly* was Oliver Wendell Holmes (1809-94), who produced several novels, much excellent poetry of the lighter kind, and, above all, *The Autocrat of the Breakfast Table* (1858) and two similar works, which may be regarded as belonging to the essay type. Nathaniel Parker Willis (1806-67) was long one of the most prolific and versatile of magazinists and miscellaneous writers, and for many years edited the *Home Journal*.

The foremost names in American poetry are those of William Cullen Bryant (1794-1878), whose *Thanatopsis* (1817) and other similar works have much affinity with Wordsworth's manner; Edgar Allan Poe (1809-49), the most striking figure in American literature, whose weird poem of *The Raven* (1844) is only one among several noteworthy efforts of his genius; Henry Wadsworth Longfellow (1807-82), author of *Evangeline* (1847), *The Golden Legend* (1851), *The Song of Hiawatha* (1855), and many other equally well-known poems; James Russell Lowell, already mentioned, whose chief serious poems are his *Vision of Sir Launfal*, and *The Cathedral*; and John Greenleaf Whittier (1807-92), a Quaker of intense moral earnestness and unshakable optimism, whose political poems form a faithful reflex of the hopes and fears of the Abolitionists throughout their long struggle. Walt Whitman (1819-92), 'the good gray poet', boldly challenged the accepted poetical conventions in his rhymeless and metreless *Leaves of Grass* (1855), *Drum Taps* (1866), and other poems, in which he seeks to inculcate a lofty conception of democracy.

Of the other poets since the beginning of last century, the principal are: Richard H. Dana (1787-1879), author of *The Buccaneer* (1827); George P. Morris (1802-64), a song-writer; Joseph Hopkinson (1770-1842), author of *Hail, Columbia!*; Francis S. Key (1780-1843), author of *The Star-Spangled Banner*; Joseph R. Drake (1795-1820), author of *The Culpit Fay*; Fitz-Greene Halleck (1790-1867), whose best works are *Fanny*, and a fine elegy on Drake; John G. Saxe (1816-87), chiefly known by humorous pieces; Jones Very (1813-80), a deeply spiritual poet; Richard H. Stoddard (1825- ), also a literary critic; John Hay, known by the dialect *Pike County Ballads*; Thomas B. Aldrich (1836- ), also a writer of stories; Paul H. Hayne and Elbridge J. Cutler, whose work was inspired chiefly by the war; George P. Lathrop, John T. Trowbridge, Theodore O'Hara (1820-67), known chiefly by his *The Bivouac of the Dead*; Bayard Taylor (1825-78), translator of *Faust* (1870-71) and author of original poems, novels, and travel books; Charles G. Leland (1824- ), whose humorous work, the *Hans Breitmann Ballads* (1867-70) in Pennsylvania Dutch, forms only a small part of his literary output; Edmund C. Stedman, also a critic; Charles G. Halpine (1829-68), who wrote both verse and prose under the pseudonym *Private Miles O'Reilly*; John H. Payne (1792-1852), author of dramas, in one of which *Home, Sweet Home* occurs; Epes Sargent (1813-80), a dramatist; Nathaniel P. Willis; Joaquin Miller (1841- ), author of *Songs of the Sierras* (1871), *Pacific Poems* (1873), and other volumes of verse, besides novels; Francis Bret Harte, better known by his stories; William Carle-

ton, author of *Farm Ballads*; James W. Riley, a dialect poet; Eugene Field; and Sidney Lanier. The chief women poets are: Alice Cary (1820-71); Phoebe Cary (1824-71); Maria G. Brooks (1795-1845), chiefly known by Zophiel; Helen M. Jackson; Sarah M. Piatt; Rose Lathrop, a daughter of Nathaniel Hawthorne; Lydia H. Sigourney (1791-1865); Julia Ward Howe, author of the *Battle Hymn of the Republic*; Lucy Larcom; Rose Cooke, also a story-writer; Celia Thaxter; Sarah C. Woolsey (Susan Coolidge), also author of stories; and Edna D. Proctor.

The novelists and story-writers are numerous, and many of them are much read outside of America, among the chief of these being William D. Howells (1837- ), a leader of the modern realist school, and a stylist of distinction who depends little on incident; Henry James (1843- ), who relies much on psychological analysis; Francis Marion Crawford (1854- ), who has given us in particular some able novels of Italian life; and Francis Bret Harte (1839-1902), author of *That Heathen Chinese*, *The Luck of Roaring Camp*, &c., who depicts with vividness and power Western life in its earlier and ruder phases. Among other writers of this class are: James K. Paulding (1779-1860), author of *The Dutchman's Fireside* (1831); Robert Montgomery Bird (1803-54), author of *Nick of the Woods* (1837), a stirring tale of frontier life; Catharine M. Sedgwick (1789-1867); William G. Simms (1806-70); George W. Curtis (1824-92); Edgar Allan Poe, who wrote masterly tales of a weird and sensational type; Harriet B. Stowe (1812-96), author of the famous *Uncle Tom's Cabin* (1852); Edward Eggleston (1837- ), author of *The Hoosier Schoolmaster* and other stories of pioneer life; Elizabeth S. Phelps (1844- ), also a poet; Louisa M. Alcott (1832-88), known chiefly by *Little Women* (1868); Charles D. Warner (1829- ), also known by essays, sketches, &c.; George W. Cable (1844- ), author of *Old Creole Days* and other descriptions of Louisiana Creole life; Edward P. Roe (1838-88), a very popular writer; Julian Hawthorne (1846- ), a son of Nathaniel; Francis R. Stockton (1834-1902), author of *Rudder Grange* and *The Lady or The Tiger?*; Richard H. Davis, author of many short stories; Hermann Melville (1819-91), author of *Typee* (1846) and *Omoo* (1847); Susan Warner (1819-85), chiefly known by *The Wide, Wide World* (1850); Edmund Quincy (1808-77), author of *Wensley* (1854); Sylvester Judd (1813-53), author of *Margaret* (1845); General Lew Wallace (1827- ), chiefly known by *Ben Hur*, *A Tale of the Christ* (1880); Sarah O. Jewett (1849- ), who depicts the local life of New England; James Lane Allen, author of *The Choir Invisible*, *The Increasing Purpose*, *A Kentucky Cardinal*, &c.; and Stephen Crane (1870-1900), author of *The Red Badge of Courage* (1895), a powerful description of war.

The American humorists, in the narrower signification of the term, depend for effect largely on grotesqueness and misspelling, but some of their work is of a more truly literary type. Among the chief names in this department are Seba Smith (Major Jack Downing, 1792-1868), Benjamin P. Shillaber (Mrs. Partington, 1814-90), Henry W. Shaw (Josh Billings, 1818-85), George H. Derby (John Phoenix), David R. Locke (Petroleum P. Nasby), Charles F. Browne (Artemus Ward, 1834-67), Edgar Wilson Nye (Bill Nye), and especially Samuel L. Clemens (Mark Twain, 1835- ), much of whose work, however, is of a higher class than that put out by other 'humorists'.

The historians include: George Bancroft (1800-91), author of a *History of the United States to*

the revolution era (1834-82); William H. Prescott (1796-1859), author of histories of Ferdinand and Isabella (1837), the Conquest of Mexico (1848), the Conquest of Peru (1847), &c.; John L. Motley (1814-77), author of *The Rise of the Dutch Republic* (1856) and a history of the United Netherlands (1861-68); Francis Parkman (1823-83), author of a history of France and England in North America (1865-92); Hubert H. Bancroft (1832- ), who has written the history of the Pacific coast states; George Ticknor (1791-1871), author of the best history of Spanish literature (1849); Richard Hildreth (1807-65), author of a history of the United States to 1821 (1849-56); John Fiske (1842-1901), a brilliant writer on philosophy and religion, who published valuable monographs on *The Critical Period in American History* (1888), *The American Revolution* (1891), *The Discovery of America* (1892), and similar historical epochs; Justin Winsor (1831- ), editor of a *Narrative and Critical History of America* (1884-89); and Henry Wilson (1812-75), who wrote on *The Rise and Fall of the Slave Power* (1872-75). The theologians include Horace Bushnell (1802-76), Henry Ward Beecher (1813-87), Phillips Brooks (1835-93), and numerous others. Among remaining writers worthy of mention are Richard H. Dana, jun. (1815-82), author of *Two Years before the Mast* (1840); Donald G. Mitchell (Ik Marvel), an essayist; Edwin P. Whipple (1819-86), a critic; and Jared Sparks (1789-1866), a biographer. Names of considerable note in science, travel, philosophy, scholarship, &c., might also be mentioned if space permitted. See Duyckinck's *Cyclopedia of American Literature* (two vols., 1875); the *American Men of Letters* series (from 1881); Nichol's *American Literature* (1885); Richardson's *American Literature* (two vols., 1887-89); Tyler's *History of American Literature* (two vols., 1878-81); Hawthorne and Lemmon's *American Literature* (1891); and Mathew's *Introduction* (1896).

UNITS, ELECTRICAL, certain definite measures in multiples of which electrical quantities and capacities are expressed. (1) The electrical resistance of a conductor is measured in *ohms*. The ohm is the resistance of 14'4521 grammes of pure mercury at 0° C., in the form of a uniform column 106'3 centimetres high. 1 *megohm* is equal to 1,000,000 ohms, and 1 *microhm* to one-millionth of an ohm. (2) The electromotive force at any point of a conductor is expressed in *volts*. The e.m.f. of a standard Clark cell at 15° C. is 1'434 volt. (3) The strength of a current is measured in *amperes*, one ampere being the current given by an e.m.f. of one volt through a resistance of one ohm. An unvarying current of one ampere when passed through a solution of silver nitrate in water deposits silver at the rate of '001118 gramme per second. (4) Quantity of electricity is measured in *coulombs*, one coulomb being the quantity conveyed in one second by a current of one ampere. (5) The *farad* is the unit of capacity, and is defined as the capacity of a condenser which requires one coulomb to charge it to a potential of one volt. The *microfarad* is one millionth of a farad. (6) The electrical unit of work, the *joule*, is the work done in a second by an ampere current in an ohm resistance. It is equal to ten million ergs. (7) The electrical unit of power, the *watt*, is the rate of working represented by one joule per second. A *kilowatt* is 1000 watts, and one horse-power is 746 watts. The above units are derived from the absolute or C.G.S. electromagnetic units by dividing or multiplying by powers of ten.

UNIVALVE, the name applied to such shells as consist of a single piece, as in the whelk, limpet, and snail.



**UNIVERSALISTS**, those Christians who believe in the final salvation of all men, in opposition to the doctrine of eternal punishment. There is, however, a great difference of opinion, in regard to the future state, among those who are called Universalists. Some believe in a remedial punishment of limited duration, which will end in a universal restoration to goodness and happiness.

**UNIVERSITIES**, the name given to a number of institutions in many countries, which all agree in being corporations designed for the encouragement of the higher education, and having the right to confer degrees in several faculties, as arts, medicine, law, and theology. In most cases the corporations constituting universities include a body of teachers or professors for giving instruction to students. In the sense here given to the word, universities are an institution not older than the twelfth century, for it was not till then that degrees were first granted. The name university is still later, not being found in any application at all like the modern one till the thirteenth century. Such phrases as *universitas magistrorum et auditorum* (or *scholarium*), meaning the whole body of teachers and scholars, are met with at the very beginning of the century. As applied to Oxford, such an expression is found in a document belonging to the year 1201. But it was not till the next century that the term *universitas* acquired a technical sense, and came to be used by itself pretty much as we use it. The three oldest universities, those of Bologna, Paris, and Oxford, grew out of schools that had previously attained a more or less wide-spread fame as seats of learning. In the early part of the twelfth century Bologna acquired great celebrity as a school of law by the lectures of Irnerius or Werner, based on the newly-discovered works of the Roman jurists. Later in the same century the lectures of Abelard on philosophy and theology attracted to Paris hearers from all parts of Europe. By the middle of the eleventh century there were undoubtedly schools at Oxford, and these acquired a new importance after the quarrel between Henry II. and Becket brought about the return to England of students studying in Paris and holding benefices in England. Earlier by a century than the oldest of these schools there existed a famous school of medicine at Salerno, in Lower Italy, but it was long before it obtained the rank of a university. The practice of granting degrees probably originated in Paris in the second half of the twelfth century. If this is the case, the University of Paris is in this sense entitled to be regarded as the oldest. (See PARIS, UNIVERSITY OF.) Students who had degrees conferred upon them were thereby entitled to teach; bachelors, or *baccalaurei*, under the supervision of a fully-qualified teacher, and masters, or doctors (*magistri, doctores*), independently. At first the universities were free and self-governing corporations, in no way dependent on either church or state. But gradually this freedom of organization was modified, owing to the increasing influence of the church. The pope granted bulls of confirmation to the universities already in existence, and till the Reformation no new universities were erected throughout Christendom without the Papal sanction. The popes also claimed the right of protecting and superintending the universities. After the Reformation the claims of the popes were, of course, no longer recognized in countries that had become Protestant. The oldest university that never sought Papal confirmation was that of Marburg, founded in 1527. The University of Paris was a corporation of teachers, that of Bologna a corporation of students, or rather two such corporations, since the students attending that school were divided into the univer-

*sitas ultramontanorum* and *universitas citramontanorum*, or students from the farther and students from the hither side of the Alps. Both of these *universitates* were schools of law, and each of them elected its own rector; but by the fourteenth century they had been practically amalgamated. In Paris the students and masters attending the university were divided into four nations; at Bologna those attending each university were divided into seventeen or eighteen nations. These divisions were originally the only ones in the universities. A division into faculties did not arise till the thirteenth century. The division of studies into theology and arts was acknowledged in the time of Abelard, and the distinction of faculties was aided by the fact that Honorius III., who feared that the general interest in legal studies would extinguish theology at Paris, forbade, in 1219, priests and regulars to read civil law. Thus the faculties of theology, arts, law, and medicine became gradually differentiated. In the thirteenth and following centuries endowed colleges were established at Paris and the English universities for the reception of poor scholars, some of whom received also pecuniary assistance from the foundation. Both in Paris and in England it became customary for all the students of the university to reside in colleges, and gradually also the colleges almost entirely superseded the universities in the work of teaching. See the articles on the universities of Paris and Oxford.

Numerous universities have been established in all countries of Europe, as well as elsewhere, from the thirteenth century down to the present time. The reader will find sufficient information regarding the university systems at present in force in England, Scotland, and Ireland, in the separate articles devoted to the universities, the chief American ones also receiving separate notice. In Germany, however, the universities have certain peculiarities to which we here draw attention. (See also FRANCE.)

The general organization of a German university is as follows:—The head of the university is a rector, elected annually, who is assisted by a committee of professors called the senate, which is also elective. In many cases there is a curator, who represents the state and bears equal authority with the rector. The academical teachers are divided into faculties, mostly four in number: theology, law, medicine, and philosophy (arts). At some of the universities there is a Roman Catholic and an evangelical (Protestant) faculty. The academical teachers are divided into ordinary and extraordinary professors, and private teachers (*Privatdozenten*) or licentiates. The ordinary professors receive a higher salary than the extraordinary ones, and otherwise have superior privileges both in the faculties to which they belong and in the affairs of the university generally. The professors are for the most part appointed by the government, but in the appointments regard is usually had to the proposals of the faculties. In the larger university towns there is usually also a small number of honorary professors. The last class of lecturers consists of those who, after undergoing an examination, have obtained permission to teach (*licentia docendi*). They receive no salary. Any person can request to be examined by the faculty in this way, and thus become empowered to teach. From them the extraordinary professors are ordinarily taken. Every person in these three classes can lecture upon whatever subject he may choose; but the ordinary professors, whatever other subjects they may select for their courses, must also lecture on the branches for which they are particularly appointed. Very often three or four courses are delivered on the same subject. The German student, in the Protestant uni-

versities, is left at full liberty to choose the lectures which he will attend, whether delivered by ordinary or extraordinary professors, or by licentiate. Usually he divides his term of study among two or more universities; but though he is thus left almost at full liberty while at the universities, he must go through a severe examination, particularly in Prussia, if he wishes to become a clergyman or statesman, or practise as physician, lawyer, or teacher in a superior school. The professors who conduct these state examinations are appointed by the government.

**UNIVERSITY COLLEGE, OXFORD.** The present foundation of this college consists of a master, 9 ordinary fellows, one civil law fellow, 15 scholars, and 14 exhibitioners. The fellowships are held for seven years, but may be extended under certain conditions. The scholarships (£80 per annum) are open to all who have not exceeded the age of nineteen. They are tenable first for two years, which are generally extended to four years in case of industry and good conduct, and for special reasons to five years. There are seven church livings in the gift of this college. See OXFORD (UNIVERSITY OF).

**UNST,** the most northern of the Shetland Islands; length, 10 miles; average breadth, between 3 and 4 miles. The surface rises to the height of 700 feet. The soil is tolerably fertile, and the pasture-grounds afford excellent feeding for sheep. There are good harbours at the villages of Baltasound and Uyeasound, and here the fishings are prosecuted with energy. Excellent ponies are exported. Pop. (1901), 1940.

**UNTERWALDEN,** one of the smaller Swiss cantons, in the centre of Switzerland, bounded on the north by the Vierwaldstätter Lake, on the east by mountains which separate it from Uri, on the south by Bern, and on the west by Lucerne. The pasturage of cattle is the chief support of the inhabitants, and there is a considerable trade in agricultural produce and in wood. The surface is mountainous; the most remarkable summits are those of Pilatus and of Titlis. The canton is divided into two valleys, Upper and Lower (Obwalden and Nidwalden), by a forest called *Kernwald*, which crosses it from north to south. Each of these valleys forms an independent state, but is represented by only one member in the council of the Swiss States, instead of two, as all the whole cantons are. The chief town of Obwalden is Sarnen, and of Nidwalden, Stanz. Area of Obwalden, 183 sq. miles; pop. (1900), 15,280; area of Nidwalden, 112 sq. miles; pop. (1900), 13,088.

**UPAS-TREE** (*Antiaris toxicaria*), a Javanese tree celebrated for its poisonous qualities, which, however, have been very much exaggerated. It was long believed in Europe that this tree was a solitary one situated in a valley in Java, that the pestilential qualities of it were so great, that neither herb nor animal could live within many miles of it, and that criminals alone were sent to gather poison from it, few of whom ever returned. There is a poison valley in Java, but its deadly effects are produced by the exhalation of carbonic acid gas from the soil. The Upas-tree belongs to the same order with the bread-fruit, the Artocarpaceæ. The flowers are monœcious. Male and female flowers are produced on the same branch at no great distance from each other. The stem rises completely naked to the height of 60 feet or more. The bark is whitish, and near the ground in old trees more than half an inch thick, and when wounded yields copiously the juice from which the poison is prepared. This juice or sap is yellowish, rather frothy, and when exposed to air its surface becomes brown. In consistence it is much like milk, but thicker and more viscid. A kind of coarse cloth is made from the fibrous inner bark, and is worn by

poor people, but if wetted by rain it affects the wearer with an intolerable itching. The preparation of poison from the sap is a secret exclusively possessed by the inhabitants of the eastern extremity of Java. It is used to poison arrows, and is speedily fatal to animals. It brings on vomiting, convulsions, and death. The manchineel of the West Indies has similar properties to the Upas.

**UPHOLSTERER BEE** (*Xylocopa caffra*), sometimes also named Carpenter Bee, is so named from its habit of making cells in wood, in which the larvæ are deposited. They are found in South Africa. Each burrow is partitioned off into a number of cells, in each of which a larva with a supply of food is placed.

**UPSALA,** a town in Sweden, 38 miles north by west of Stockholm, on the Fyrisa, which is crossed by five bridges, and enters an arm of Lake Mælær. It contains a large cathedral, erected in 1260–1435, and restored in 1883–93, and other churches. The cathedral contains the tombs of some Swedish kings, and many other monuments, among which is that of Linnæus. The Archbishop of Upsala is the primate of Sweden. The University of Upsala, founded by Sten Sture in 1477, has a library of over 200,000 volumes, besides rare manuscripts, among which is the Codex Argenteus, a manuscript of Ulfilas; also a botanical garden, an observatory, &c. Its present building, in Renaissance style, was erected in 1877–86, and the library building, erected in 1819–41, was restored in 1888–92. A great fair has been held here since the earliest times in the beginning of February. Pop. (1900), 22,855.

**URAL,** formerly JAÏK, a river of Russia, which rises in the Ural Mountains, in the north of the government of Orenburg, near lat. 55° N.; flows south past Verkhnei-Uralsk to Orsk, then west through an opening in the Ural chain to Orenburg, where it turns south-west and then south, till it reaches the Caspian, and enters it by several mouths, the largest of which passes close to Guriev. Its course is about 1000 miles. It abounds with fish.

**URAL-ALTAIC, or TURANIAN, also FINNO-TATAR,** names given to a family of languages spoken over a wide area in Eastern Europe and Northern Asia, and comprising at least six branches, viz. Ugric, Turkic, Finnic, Samoyedic, Mongolic, and Tungusic, perhaps also Japanese and Korean. These languages are all of the agglutinating or agglutinative type, that is, in the structure of their words the root always stands clearly out as distinct from the suffixes or other elements more or less loosely tacked on to it. Another feature of these languages is the law of vowel harmony by which the vowels of the suffixes or formative elements are assimilated to that of the root. See PHILOLOGY, &c.

**URAL MOUNTAINS,** a long and comparatively narrow chain, stretching nearly north and south from the shores of the Arctic Ocean to the south frontiers of the government of Orenburg, in Russia. During the whole of this extent it forms the boundary between Europe and Asia. The North Ural is constituted more or less of a simple central ridge, while the South Ural forms separate ridges, diverging in a fan-shape from a common nucleus. The average height of the Ural Mountains is 2000 to 2500 feet, but there are several summits above 5000 feet. The South Ural is most picturesque and diversified, and is to a great extent a pastoral country. The Ural Mountains consist chiefly of chloritic, quartzose, and metamorphic rocks, and are celebrated for the mines of gold, platinum, copper, and magnetic iron which they contain, more especially in the South Ural. In the south are many valleys of remarkable fertility.

The principal rivers fed by the Ural chain are the Petchora, and numerous affluents of the Obi, belonging to the Arctic Ocean; and the Kama and Ural, belonging to the Caspian.

**URALSK**, a town in Asiatic Russia, capital of Uralsk province, on the right bank of the Ural, 170 miles w.s.w. of Orenburg. It has a considerable trade, especially in fish caught in the Ural, and in caviar, which is prepared there. Pop. (1897), 36,597.

**URANIA**, the muse of astronomy, a daughter of Zeus and Mnemosynê. She is generally represented with a crown of stars, in a garment spotted with stars, and holding in her left hand a celestial globe or a lyre. See **MUSES**.

**URANIUM**, a metallic element usually regarded as belonging to the iron group. Its symbol is U, and its atomic weight is 239.5. Its specific gravity is 18.69. It is one of the rarer elements, and does not occur in nature in the free state. The chief natural sources of the element and its compounds are: *pitchblende*, mainly composed of the oxide  $U_3O_8$ , a pitch-black, greenish or grayish mineral, found mostly massive but sometimes in octahedral crystals at Joachimsthal in Bohemia, in Saxony, in Norway, in Cornwall, and in the United States; *torbernite*, or *copper uranite*, a hydrated copper uranium phosphate occurring in Saxony and Cornwall in pearly-green tetragonal and partly transparent crystals; *autunite*, or *lime uranite*, a hydrated calcium uranium phosphate occurring in France, Saxony, and Cornwall in micaceous sulphur-yellow orthorhombic crystals; *uraconite*, or *uranium ochre*, a lemon-yellow substance containing the hydroxide and the sulphate, often associated with pitchblende; &c.

Uranium was first discovered by Klaproth in 1789, but he mistook an oxide for the metal, and it was not till about 1840 that Pélitot isolated the true element. It may be obtained from uranous chloride by treating it with sodium, and when compact is a malleable, silvery metal, like nickel in appearance, with a specific gravity of 18.7. It melts at a red heat, and the powder burns, forming the oxide  $U_3O_8$  when heated to about 400° F. Its oxides are:  $UO_2$ , a basic substance known as *uranyl*;  $UO_3$ , uranyl oxide, which yields uranyl salts and uranates;  $UO_2 \cdot UO_3$  or  $U_2O_5$ , a black body produced by igniting the nitrate, used for glazing porcelain; and  $UO_2 \cdot 2UO_3$  or  $U_3O_8$ , a green substance formed by oxidizing the former. If one of the oxides be dissolved in nitric acid, uranyl nitrate is formed and may be obtained from the solution in fluorescent, lemon-yellow crystals. This salt is used in the estimation of arsenic and phosphoric acid, and also in photography. In its practical applications it may be replaced by uranyl acetate, which is prepared from it. Sodium uranate is called *uranium yellow*, and is used commercially in painting glass and porcelain, and in the preparation of a fluorescent glass called *uranium glass*. On the large scale it is prepared by roasting pitchblende with lime, dissolving the calcium uranate so produced in dilute sulphuric acid, acting on the resulting uranium sulphate solution with excess of sodium carbonate, neutralizing with dilute sulphuric acid, and boiling till the uranium yellow is precipitated.

**URANUS**. According to the cosmo-theogony of the Greeks, *Gæa* (Earth) proceeded from chaos (the infinite void of space). The Earth produced Uranus (in remote antiquity, the personification of the sphere of light, the heavenly vault), and by him became the mother of the Titans (see **TITANS**), the Hecatoncheires (hundred-handed), and the Cyclopes.

**URANUS**, the seventh planet from the sun. The mean distance of Uranus from the sun is 1,782,000,000

miles; its equatorial diameter is taken as 33,000 miles; the eccentricity of its orbit is .046,578, and the angle between the plane of its orbit and that of its equator is very small. The density of Uranus is .195 (the earth being taken as 1). Sir William Herschel discovered Uranus in 1781. Herschel called the planet *Georgium Sidus*, and it has been called also the planet Herschel, but to make the name uniform with those of the other planets Uranus has been now universally adopted. Sir William Herschel observed two satellites of Uranus, those now known as Oberon and Titania, and in 1851 Mr. Lassell detected other two satellites interior to these, to which the names of Ariel and Umbriel have been given.

**URBANISTS**. See **FRANCISCANS**.

**URBINO**, a town in Italy, in the province of Pesaro e Urbino, on an isolated hill in the midst of bleak and desolate mountains, 21 miles west by south of Pesaro. It is the see of an archbishop, and the seat of a university with two faculties—jurisprudence, and mathematics and natural science. Among the buildings deserving of notice are the ducal palace, one of the finest edifices of the kind in Italy, and the cathedral. Urbino is the birthplace of the painter Raphael. His house is still shown, and a statue of him was erected in 1897. From 1474 to 1626 Urbino was the capital of a duchy. Pop. 6000.

**URCHIN**, SEA. See **ECHINODERMATA**.

**UREA** ( $N_2H_4CO$ ), the name given to a crystalline compound which is present in the urine of all mammiferous animals. This substance likewise occurs in small quantities in the blood of man and of some of the lower animals, in the vitreous humour of the eye, and in the chyle and lymph of various animals. The formation of urea is probably to be traced to the decomposition in the system of albuminous bodies taken as food: the greater part, if not the whole, of the nitrogen contained in these bodies being excreted in the form of urea. Urea may be obtained from urine by evaporation and exhaustion of the residue with alcohol; or by treating the partially evaporated liquid with nitric acid, separating the crystals of nitrate of urea which are thereby formed, decomposing them by means of carbonate of barium, filtering, and evaporating the filtrate. Urea may be prepared artificially by decomposing cyanate of potassium with sulphate of ammonium, filtering, evaporating the liquid—which contains ammonium cyanate—to dryness, dissolving the residue in alcohol, and crystallizing. It was by such a process that Wöhler prepared urea in 1828; from the time of this research of Wöhler we may date the beginning of the science of organic chemistry. Before 1828 it was generally believed that those compounds which are found in the bodies of animals and of plants could not be prepared by any other means than by the agency of the so-called 'vital force'. But the artificial preparation of urea proved this theory to be false, and paved the way for the preparation of a large number of substances which had heretofore been regarded as products solely of vital functions. The preparation of urea by the method sketched above is also interesting as affording an instance of the change of one substance into another possessed of the same percentage composition, but of very different properties. The formula  $N_2H_4CO$  expresses at once the empirical composition of ammonium cyanate and of urea; the difference between these compounds is usually supposed to be due to a difference of arrangement of the constituent atoms of each: thus the formula of the former is written  $(NH_4) CNO$ , that is, the ammonium salt of cyanic acid ( $HCNO$ ); while that of the latter is written  $CO (NH_2)_2$ , that is, carbonyl chloride ( $CO Cl_2$ ), in which two chlorine

atoms are replaced by the group  $(\text{NH}_2)$  twice. Urea crystallizes in long prisms which have a cooling taste resembling that of nitre; the crystals are soluble in water and in alcohol; they melt at  $120^\circ \text{C}.$ , and decompose at higher temperatures.

Urea combines with acids forming crystalline substances, of which the hydrochlorate  $\text{N}_2\text{H}_4\text{CO.HCl}$  may be taken as the representative; it also combines with metallic oxides, forming such compounds as  $\text{N}_2\text{H}_4\text{CO.2HgO}$ ; and with salts, giving rise to a series of compounds represented by the body  $\text{N}_2\text{H}_4\text{CO}$ .  $\text{AgNO}_3$ . The hydrogen of urea may be partly replaced by alcoholic or acid radicles, whereby a series of compound ureas is produced; of these *diethyl urea*,  $\text{N}_2\text{H}_2(\text{C}_2\text{H}_5)_2\text{CO}$ , may be taken as a representative.

UREDO, a pseudo-genus or stage in the development of certain fungi. See FUNGI and BUNT.

URETER, the excretory duct of the kidneys (which see), which serves to convey the urine from the latter organs to the urinary bladder or cloaca, as the case may be. In Teleostean Fishes the ureters open behind the anus or termination of the alimentary system. In some fishes (for example, *Amia*) each ureter dilates into a bladder-like structure. In such lower mammals as the *Ornithorhynchus*, and in Reptiles, the ureters open into the cloaca, or chamber common to the terminal ducts of the urinary, generative, and alimentary systems. In man each ureter averages from 16 to 18 inches in length, and is of the average diameter of a goose-quill. It consists of three coats, an outer or fibrous, a middle or muscular, and an inner or mucous coat. The ureter on leaving its kidney passes behind the peritoneum or lining membrane of the abdomen, at the back of the latter cavity. It runs downwards and inwards from the lower part of the pelvis of the kidney, and enters the cavity of the bony pelvis (which see), passing downwards and forwards to open into the base of the bladder. The ureters open into the bladder each by a constricted orifice, and each in its course lies upon the psoas muscle. They derive their nerves from the inferior mesenteric, spermatic, and hypogastric plexuses; and their blood-vessels form the renal, spermatic, and other arterial trunks. See also KIDNEY.

URETHRA, the canal leading from the bladder to the external urinary opening, and serving for the excretion of the urine (which see). In the male the urethra traverses the penis, and its length varies from 8 to 9 inches. In the female it is a narrow membranous canal attaining a length of about one and a half inch, with a normal diameter of about  $\frac{1}{4}$  inch. It is thus a much more complicated structure in the male than in the female, and its anatomy and relations have to be carefully studied by the surgeon in view of the diseases to which it is subject, and also in connection with the important operations of *lithotomy* and *lithotripsy*, or those of cutting for calculus or stone in the bladder, and for crushing the stone respectively. The urethra in man consists of three coats: a mucous, a muscular, and an erectile coat. In the female the urethra is capable of great distension, so much so that it may be artificially dilated so as to permit the removal of calculi from the bladder without further operation.

URI, a canton in Switzerland, bounded by Schwyz, Unterwalden, Bern, Valais, Tessin, Grisons, and Glarus; area, 415 square miles. It is one of the most mountainous of the Swiss cantons, presenting a complete chaos of deep ravines, narrow valleys, and mountain-masses, none of which have a less elevation than 5000 feet, while the greater part are from 8000 to 9000 feet, and several above 10,000 feet. The most famous, though not the highest mountain, is the St. Gothard. So completely is the canton hemmed in

by these mountain chains, that the only practicable outlets from it are the pass of St. Gothard in the south, that of Oberalp in the south-east, Furka in the south-west, and the Vierwaldstätter Lake in the north. The Reuss traverses the canton from south to north. The climate cannot be regarded as temperate except in the lowest grounds. There is little agriculture, properly so called. In the lower grounds are gardens sown with corn, rape, and hemp, or planted with potatoes and vegetables. The meadows are remarkable for their richness. Fruit-trees and walnuts and chestnuts flourish. The chief town is Altorf. Other remarkable places are Bürglen, where Tell is said to have been born, and the meadow of Rütli, where the representatives of the three original cantons, Schwyz, Uri, and Unterwalden, met in 1307 to plan the insurrection by which the house of Austria was expelled. The inhabitants are almost all Roman Catholics, and speak German. Pop. (1900), 19,701.

URIC ACID. See URINE.

URIM AND THUMMIM ('light and perfection'), parts of the dress of the Jewish high-priest, by means of which he gave oracular answers to the people. What they were, and the mode in which the divine will was communicated to the high-priest by means of them, is disputed among critics. All that we know is that Moses was directed to put them in the breastplate, so that they should be upon Aaron's heart when he went in before the Lord (Ex. xxviii. 30). Many biblical scholars believe that the twelve precious stones on the breastplate, on each of which was written the name of one of the tribes of Israel, are what was meant; and Josephus and the Rabbins supposed that these stones indicated the divine will by a preternatural luminousness.

URINE is an excrementitious fluid, designed for ejecting from the system substances which, by their accumulation within the body, would prove fatal to health and life. It is secreted by the kidneys, whose sole office it appears to be to separate from the blood the waste products which are yielded by the oxidation of the nitrogenous portions of the food, and which are of no further use in the body. The substances which, in particular, pass off in this way are nitrogen and various saline and earthy compounds. In its natural state urine is transparent, of a yellow colour, a peculiar smell, and saline taste. Its quantity, and in some measure its quality, depend on the seasons and the peculiar constitution of the individual, and are likewise modified by disease. It is observed that perspiration carries off more or less of the fluid which would else have passed off by urine; so that the profusion of the former is attended with the diminution of the latter. The specific gravity of the most concentrated urine is 1.030: the average gravity is, however, 1.020. It gives a red tint to litmus paper—a circumstance which indicates the presence of a free acid, or of an acid salt. Though at first quite transparent, insoluble matter is deposited on standing; so that urine voided at night is found to have a light cloud floating in it by the following morning. This insoluble substance consists in part of mucus, and partly of urate of ammonium, which is much more soluble in warm than in cold water. Urine is prone to spontaneous decomposition. When kept for two or three days it acquires a strong smell; and as the putrefaction proceeds the disagreeable odour increases, until at length it becomes exceedingly offensive. As soon as these changes commence the urine ceases to have an acid reaction, and earthy phosphates are deposited. In a short time free alkali makes its appearance, and a large quantity of carbonate of ammonium is gradually generated. Similar changes may be produced in

recent urine by continued boiling. In both cases the phenomena are owing to the decomposition of urea, a nitrogenized compound, and one of the normal constituents of urine. See **UREA**.

The following are the more important constituents of normal urine.

1. *Water*. 2. *Inorganic salts*, including chlorides, phosphates, sulphates, nitrates, carbonates, and silicates of potassium, sodium, ammonium, calcium, magnesium, and iron. 3. *Nitrogenous bodies*, chiefly urea, uric acid, hippuric acid, creatinine, xanthine, sugar, lactic, succinic, oxalic, formic, and phenylic acids. 4. *Colouring matters*, the principal of which is urochrome. In various diseases colouring matters different from those found in normal urine are present. 5. *Albumenoid matters and ferments*. 6. *Extractive matter*.

*Uric acid* ( $C_5H_4N_4O_3$ ) is a constant ingredient in urine; it sometimes occurs in the state of a white impalpable powder, sometimes in small four-sided prisms, having considerable lustre. It is tasteless, colourless, and insoluble both in water and alcohol. In concentrated sulphuric acid it speedily assumes the form of a jelly, and with the aid of a little heat a complete solution is obtained. In nitric acid, even though dilute, it dissolves with effervescence; and when the solution is evaporated to dryness, and the dry yellow residue is treated with ammonia, it assumes a fine pink colour, owing to the formation of a compound called Murexide. Uric acid is dibasic; it combines with the different bases, and forms salts called *urates*. The only important urates are those of ammonia, potash, and soda. Urate of ammonia is soluble to a considerable extent in boiling, but more sparingly in cold water. The urates of soda and potash, if neutral, are of very feeble solubility; but an excess of either alkali takes up a large quantity of the acid. When uric acid is heated in a retort carbonate and cyanate of ammonia and hydrocyanic acid are formed, and a volatile acid sublimes, called *cyanuric acid*.

Such is a general view of the composition of human urine in its healthy state. But this fluid is subject to a great variety of morbid conditions, which arise from the deficiency or excess of certain compounds which it ought to contain, or from the presence of others wholly foreign to its composition. Of those substances which are sometimes contained in the urine the most remarkable is sugar, which is secreted by the kidneys in diabetes. Diabetic urine has a sweet taste, and yields a syrup by evaporation, is almost always of a pale straw colour, and in general has a greater specific gravity than ordinary urine. The sugar when properly purified appears identical, both in properties and composition, with grape-sugar or glucose. The acidifying process which is constantly going forward in the kidneys, as evinced by the formation of sulphuric, phosphoric, and uric acids, sometimes proceeds to a morbid extent, in consequence of which two acids, oxalic and nitric, are generated, neither of which exists in healthy urine. The former, by uniting with lime, gives rise to one of the worst kinds of urinary concretions; and the latter appears to lead to the formation of purpurate of ammonia by reacting on uric acid. In severe cases of jaundice the bile passes from the blood into the kidneys, and communicates a yellow colour to the urine. Though albumen is contained in a very minute quantity in healthy urine, in some diseases it is present in large proportion. It is characteristic of certain kinds of dropsy. In certain states of the system urea is generated in an unusually small proportion. This occurs especially in diabetes mellitus, and in acute and chronic inflammations of the liver. An abundant secretion of uric acid is by no means un-

common. In some instances this acid makes its appearance in a free state; but happily it generally occurs in combination with an alkali, especially with soda or ammonia. The undue secretion of these salts, if temporary, occasions scarcely any inconvenience, and arises from such slight causes that it frequently takes place without being noticed. This affection is generally produced by errors in diet, whether as to quantity or quality, and by all causes which interrupt the digestive process in any of its stages, or render it imperfect. Dr. Prout specifies unfermented, heavy bread, and hard-boiled puddings or dumplings, as, in particular, disposing to the formation of urates. These sediments have commonly a yellowish tint, which is communicated by the colouring matter of the urine; or, when they are deposited in fevers, forming the lateritious sediment, they are red, in consequence of the colouring matter of the urine being then more abundant. As long as uric acid remains in combination with a base it never yields a crystalline deposit; but when this acid is in excess and in a free state, its very sparing solubility causes it to separate in minute crystals, even within the bladder, giving rise to two of the most distressing complaints to which mankind are subject—to *gravel* when the crystals are detached from one another, and, when agglutinated by animal matter into concrete masses, to the *stone*. These diseases may arise either from uric acid being directly secreted by the kidneys, or from the formation of some other acid, by which the urate of ammonia is decomposed. The tendency of urine to contain free acid occurs most frequently in dyspeptic persons of a gouty habit, and is familiarly known by the name of the uric or lithic acid diathesis. In these individuals the disposition to undue acidity of the urine is superadded to that state of the system which leads to an unusual supply of urates. A deficiency of this acid in urine, however, is no less injurious than its excess. As phosphate of lime in its neutral state is insoluble in water, this salt cannot be dissolved in urine except by being in the form of a superphosphate. Hence it happens that healthy urine yields a precipitate when it is neutralized by an alkali; and if, by the indiscriminate employment of alkaline medicines, or from any other cause, the urine, while yet in the bladder, is rendered neutral, the earthy phosphates are necessarily deposited, and an opportunity afforded for the formation of a stone. The microscopic and the chemical examination of the urine are now looked upon as most important aids to diagnosis, not only in diseases of the kidneys and bladder, but in diseases of remote organs and of the system at large.

**URN.** See **VASE**.

**UROPYGIUM**, the oil or tail gland of birds. See **ORNITHOLOGY**.

**URSA MAJOR**, a northern constellation (the Greater Bear). The seven brightest stars of Ursa Major are well known as Charles's Wain, as the Plough, and sometimes as the Butcher's Cleaver. Two of these seven stars are called the pointers, because they and the pole-star lie nearly in a right line, and these stars direct an observer to the pole-star.

**URSA MINOR**, a northern constellation (the Lesser Bear). Ursa Minor contains the pole-star.

**URSON**, a name given to the *Erethizon dorsatum*, or Canadian Porcupine. See **PORCUPINE**.

**URSULA**, St., a virgin martyr, according to the legend a daughter of a prince in Britain put to death at Cologne by a horde of Huns, some say in 384, others in 453, together with 11,000 virgins who accompanied her. According to another reading the number of her companions was only eleven. The number may have been increased to 11,000 by a mistake in

taking the name of one of her attendants (called, according to the legend, and according to a missal which belonged to the Sorbonne, *Undecimilla*) for a number (Lat. *undecim millia*, eleven thousand). The Roman martyrology mentions the saint and her virgin companions without stating their number. Some bones, said to be those of herself and her companions, are still shown to visitors. The day dedicated to her honour is the 21st of October. St. Ursula was the patroness of the Sorbonne. See Baring-Gould's *Popular Myths of the Middle Ages*, also URSULINES.

URSULINES, or NUNS OF ST. URSULA, a sisterhood founded by St. Angela Merici at Brescia in the early part of the sixteenth century, at first without being bound to the rules of conventual life, but devoting themselves merely to the practice of Christian charity, especially in nursing the sick and the education of children. In 1537 a rule was drawn up for them by their founder, and received the sanction of the Bishop of Brescia. The order spread over Italy, and was then introduced into France, where it increased very rapidly. Within a hundred years after its foundation the order is said to have had 350 convents in France. The order found large numbers of adherents in other parts of Europe, and latterly has been introduced into Britain and America. The members of the order add to three religious vows a fourth, to occupy themselves gratuitously in the education of children of their own sex. The order is under the superintendence of the bishops. The congregations of Ursulines did not universally accept the conventual rule.

URSUS. See BEAR.

URTICACEÆ, or NETTLEWORKS, a natural order of dicotyledons, comprising trees, shrubs, and herbs, with opposite or alternate leaves, having small, flat, membranous stipules, and usually covered either with asperities or stinging hairs; inconspicuous flowers, scattered or clustered, or in catkins or close heads; a membranous, lobed, persistent calyx; definite, distinct stamens, inserted into the base of the calyx; anthers often curved inwards in æstivation, and backwards in bursting; a superior simple ovary, with a solid erect ovule; fruit in the form of a simple indehiscent nut, and a straight, albuminous embryo. The species are found almost everywhere. They are chiefly characterized by the excessive causticity of their juice, which is much more powerful in some of the East Indian nettles than in those of Europe, producing very painful sensations that last for a week or ten days. Owing to the tenacity of the fibres of some species a tough cordage has been successfully manufactured from them. See BØHMERIA and NETTLE.

URUGUAY, a river of South America, rising in the Brazilian state of Santa Catharina, in the Serra Geral, near the Atlantic coast, by several head-streams (Pelotas, Santa Anna, Marombas). It flows first west, separating the Brazilian states of Santa Catharina and Rio Grande do Sul, and then south-west and south, separating the Argentine Republic on the west from Brazil and Uruguay on the east. It passes the towns of Salto, Paysandu, Concepcion, and Fray Bentos, and enters the La Plata estuary above Buenos Ayres. It is about 960 miles long, and is navigable by sea-going vessels to Paysandu, 200 miles up. Its chief tributary is the Rio Negro, in Uruguay.

URUGUAY, or REPÚBLICA ORIENTAL DEL URUGUAY, a republic of South America, bounded on the north and north-east by Brazil, on the east by the Atlantic, on the south by the Rio de la Plata, and on the west by the Uruguay, separating it from the Argentine Republic. It is of a compact

shape; area, estimated at 72,150 square miles. The surface forms a vast undulating plain, generally flat towards the Uruguay, the Rio de la Plata, and the sea-coast, but broken in the interior by several ridges of moderate elevation. The principal river is the Negro, which, rising on the north-east frontier, flows south-west and enters the estuary of the Uruguay, dividing the state into two nearly equal portions. On the south-east frontier is the large lake of Merim, which is chiefly in Brazil. The climate is mild, frost being unknown, and the excessive summer-heats being greatly tempered by sea-breezes. The extensive plains, covered with rich sward and almost destitute of trees, seem admirably adapted for agriculture; but owing partly to the thinness of the population they remain for the most part as pasturage for immense herds of horses, cattle, and sheep. The leading industry is the preparation of animal products, such as jerked beef, frozen meat, beef extracts, tinned tongues, hides, skins, tallow, and wool, which form the chief exports. Some towns, such as Fray Bentos, Mercedes, and Paysandu, are little better than huge shambles. The value of the imports in 1901 was £5,041,000, and of the exports, £5,900,000. There are over 1200 miles of railway. The permanent army consists of about 3000 men, besides the active civilian and police forces. The revenue of late years has amounted to about £3,300,000, chiefly derived from customs duties. The actual accounts of revenue and expenditure usually exhibit large deficits, and there is a total foreign debt of over £20,000,000. The legislative body is a parliament composed of two houses, a senate and a chamber of representatives; the head of the executive is a president, elected for four years. Montevideo is the capital and chief port. The estimated pop. of the state in 1900 was 930,680. There is a considerable immigration, especially of Italians.

Uruguay at one time formed a part of the Spanish viceroyalty of Buenos Ayres, and when in 1811 it severed its connection with Spain a period of confusion followed in Uruguay, during which the Brazilian government incorporated the latter territory with its own (1821). When, shortly after, Brazil broke away from Portugal, the republic of Buenos Ayres refused to recognize Dom Pedro as Emperor of Brazil unless Uruguay were restored. A war broke out in consequence which lasted till 1828, when peace was concluded through the mediation of Great Britain. In that peace Uruguay was recognized as an independent state, and in 1830 a republican constitution was adopted. Since that time the history of Uruguay has consisted of little else than a series of civil and foreign wars.

URUMIYAH, or OORMIA, a town and lake of Persia, in the west of the province of Azerbaijan. The town is situated on an extensive plain about 10 miles west of the lake, and 65 miles south-west of Tabreez. It claims to be the birthplace of Zoroaster, and in the vicinity are several mounds, supposed to have been made use of in the ceremonies of the ancient fire-worshippers. The surrounding district is of surpassing fertility, and forms one vast extent of groves, orchards, vineyards, gardens, rice-grounds, and villages. Pop. of the town, about 30,000.—The lake, situated 4300 feet above sea-level, is about 80 miles long from north to south, by 20 miles broad. It is extremely shallow throughout. Numerous islands are scattered over its surface. Its waters are so salt that neither fish nor molluscs can live in it.

URUS. See OX.

USAGE, in law. See COMMON LAW and PRESCRIPTION.



**USBECKS**, a Turkish tribe which at one time formed the ruling class throughout Western Turkistan, in Bokhara, Khokand, Khiva, and Balkh, and partly also in Eastern Turkistan. In Western Turkistan they are now completely under the influence of Russia, but in the districts mentioned they still form a sort of nobility, living mostly in towns, and owning the numerous castles and strongholds which are scattered over these lands. They are to a remarkable degree active, bold, and indefatigable in war.

**USEDOM**, a Prussian island in the Baltic, separated from the coast of Pomerania partly by the Peenestrom and partly by the Little Haff, about 30 miles in length, of a very irregular form; area, 150 square miles. The surface is covered with marshes, forests, and lakes, but there is some good meadow and arable land. The inhabitants are employed in agriculture, navigation, and fishing. The chief towns are Swinemünde and Usedom. Pop. about 33,000.

**USHANT** (French, *Ouessant*), an island of France, 15 miles off the west coast of the department of Finistère, to which it belongs; area, 6 square miles. It is almost entirely composed of granite, and presents a very bold and rocky coast, which is accessible only at some points. Fishing and the rearing of sheep are the principal occupations of the inhabitants. St. Michael is the chief place. Two naval engagements were fought off the island between the French and English. In the first Sir Edward Hawke defeated Admiral Conflans (1759); the second, in which the commanders were Admiral Keppel and Count D'Orvilliers, was indecisive (1778). Ushant with the surrounding islets forms a commune having a pop. of 2377.

**USHER** (French, *huissier*), an officer who has the care of the door of a court, hall, chamber, or the like. —The *gentleman usher of the black rod* is an official of the House of Lords, on which he attends during the sessions of Parliament. His badge is a black rod, with a lion, in gold, at the top. He assists at the ceremony of introducing a new peer to the house, and has the duty of summoning the Commons when their attendance is required in the House of Peers.

**USHER**, or **USHER**, JAMES, Archbishop of Armagh, in Ireland, born at Dublin in 1581. He took orders in 1601, and in 1607 received the professorship of divinity at Trinity College, Dublin, and the office of chancellor of St. Patrick's; in 1620, the bishopric of Meath; in 1623, a place in the Irish privy-council; and the primacy of Ireland in Jan. 1624 (the Archbishopric of Armagh). His notions of church government verging towards Presbyterianism, his enemies took advantage of this to attempt to destroy his credit with James I.; but he enjoyed to the last the esteem of that king. He attended Strafford in prison and at his execution. During the civil war he was a staunch adherent of Charles I., and witnessed the execution of the king. After that event he experienced civility and flattering promises from Cromwell. He died at Reigate, Surrey, in 1656, and the protector ordered that he should be interred in Westminster Abbey. Archbishop Usher carried on an extensive correspondence with the learned in various parts of Europe, and was a man of great erudition. He wrote a number of works, the principal of which are the *Annals of the Old and New Testament*, which forms the basis of the received biblical chronology; *Britannicarum Ecclesiarum Antiquitates*; and a *Body of Divinity*, compiled surreptitiously from his sermons and notes, and published without his approbation. See Aikin's *Lives of Selden and Usher* (1812).

**USUFRUCT** (*usus fructus*), in the civil law, the temporary use or enjoyment of any lands or tene-

ments, or the right of receiving the fruits and profits of an inheritance, or other thing, without a power of alienating the thing or changing the property thereof. The relations between the proprietor and the usufructuary are settled by the agreement made between them.

**USURY**. See **INTEREST**.

**UTAH** (formerly the *Deseret* of the Mormons), one of the United States, bounded north by Idaho and Wyoming, east by Wyoming and Colorado, south by Arizona, and west by Nevada; greatest length, north to south, 350 miles, average breadth, about 260 miles; area, 84,970 square miles. It is divided by the Wahsatch Mountains into two unequal portions; a hilly country on the east, drained by the Green and Grand Rivers (the head streams of the Colorado), the Colorado itself, and their numerous tributaries; and a high and generally sterile table-land on the west, the drainage of which has no outlet to the sea, but terminates in or connects the different lakes. Of these the largest are the Great Salt Lake in the north-west (see **GREAT SALT LAKE**), and Utah Lake, about 25 miles to the south-east, a beautiful sheet of fresh water having an area of 130 square miles. The rivers are mostly rapid and unnavigable, running through rocky cañons whose walls often rise 2000 feet above the stream. Some of the peaks of the Wahsatch Mountains are above the snow-line, reaching an altitude of 10,000 to 13,000 feet above sea-level, while the valleys have an average elevation of 5000 feet. The mild and healthy climate and the fertility of the river valleys render certain portions of the territory a good field for the agriculturist, although the general want of water operates unfavourably, it having been estimated that nineteen-twentieths of the soil is hopelessly sterile. In the fertile districts wheat, oats, barley, and potatoes are grown successfully, and the fruits and vegetables peculiar to the temperate zone are produced abundantly. Cattle-raising is carried on very profitably on the open plains where agriculture could not succeed. Valuable deposits of gold, silver, copper, lead, iron, coal, and other minerals exist, and the production of the mines is annually increasing. Internal communication is maintained by several railway systems, including lines of the Central Pacific and the Union Pacific railways. The educational establishments include a university at Salt Lake City. Utah formerly belonged to Mexico, but was acquired by the United States in 1848. Its limits were formerly much larger. It has been occupied since 1847 by the Mormons, who settled here after they had been expelled from Illinois (see **MORMONS**). The Mormons were long the chief inhabitants, and would have preferred to remain so as well as to retain their peculiar institutions, but the influx of 'gentiles' brought the rule of the Mormon church to an end, and polygamy is not now openly practised. A law was passed in 1894 making Utah a state (taking effect in 1896). The capital is Salt Lake City. Pop. in 1850, 11,380; in 1860, 40,273; 1870, 86,786; 1880, 143,907; 1890, 207,905; and in 1900, 276,749.

**UTERUS**, or **WOMB**, the organ which in higher Mammalia receives the fecundated or impregnated ovum or germ, in which the embryo is contained and developed, and from which, when mature, it is finally born or expelled. The uterus lies between the bladder and rectum or terminal part of the bowel. In the virgin female it is somewhat pear-shaped, flattened from above or before backwards, and projecting below by its cervix (or neck) and os (or mouth) into the vagina—this latter being the membranous canal communicating externally, and through which the embryo or young, when mature, is born. In the unimpregnated state the uterus measures



about 8 inches in length, 2 inches broad, 1 inch in thickness, and about 1½ oz. in weight. It is divided into a *fundus* or base, a *body*, and a *cervix* or neck. It opens into the vagina by an aperture (*os uteri*) of transverse shape. The organ is retained in its place by certain ligaments, derived from the peritoneum, of which the chief are the *round* and *broad ligaments* of each side. Its internal cavity is of small size when compared with the bulk of the organ, and at each superior angle at the fundus a *Fallopian tube* or oviduct enters. These tubes serve to convey the ova or eggs from the *ovary* (which see) to the uterus. In structure, the uterus is composed of three coats. The outer coat is serous in structure, the middle coat is muscular, and the internal is mucous. The middle coat becomes largely developed in the impregnated uterus, and constitutes the muscular layer concerned in the forcible expulsion of the child. The arteries of the uterus are derived from the internal iliac and aorta, and are named *uterine* and *ovarian*. The veins are of large size, and are named *sinuses* in the impregnated state. The nerves come off from the inferior hypogastric and spermatic plexuses, and from the third and fourth sacral nerves. In old age the uterus approaches in appearance and dimensions to its infantile or early proportions.

The womb is liable to many diseases, of which the most frequent and important are inflammatory affections and tumours. From its connection with the menstrual function and its intimate relations to the ovaries the womb is singularly liable to derangements, which are rather functional than of organic nature; and in certain diseases of its ligaments and surroundings (vagina, Fallopian tubes, &c.) the uterus participates to a greater or less extent. *Uterine catarrh*, marked by pain and discharge; inflammation or *metritis* (acute and chronic); *ulceration* of the *os* and *cervix uteri*; cancer; and tumours (fibroid, fibrous, polypi, cystic tumours, &c.) comprise the most common of uterine lesions. In addition to these actual diseases the womb is liable to become *displaced* in various ways, from laxity of its ligaments and from other causes (see *PROLAPUS UTERI*); and the treatment of these displacements forms a highly important branch of obstetric medicine.

UTICA, a city of the United States, in New York, situated on a beautiful slope on the right bank of the Mohawk, 95 miles west by north of Albany. It has wide and spacious streets, cotton factories, boot and shoe factories, flour, grist, and saw mills, tanneries, foundries, machine shops, &c.; and an extensive trade, especially in cheese, greatly facilitated by canals and railways. Pop. (1890), 44,007; (1900), 56,333.

UTILITARIANISM, the school or theory of morals which defines virtue as consisting in utility. The name is more specially applied to the school founded by Jeremy Bentham, of which the greatest exponent was John Stuart Mill, but there are other developments of the same principle both in ancient and modern schools of morals. The Utilitarian theory may be traced back to Epicurus, or perhaps to Aristotle; the former at least defined happiness as the sole end of virtue, and this position distinguishes all to whom the name of Utilitarian is properly applied, and all who consistently maintain this principle are Utilitarians. See Sir Leslie Stephen's *The English Utilitarians* (1900); also *ETHICS*.

UTOPIA, a name invented by Sir Thomas More, from the Greek *ou topos* (no place), and applied by him to an imaginary island, which he represents as discovered by a supposed companion of Amerigo Vespucci, who describes its condition to More at Antwerp in 1514. He gave an account of this imaginary island in his work called *Utopia*, written in Latin, and published at Louvain and Antwerp in

1516. The author describes in this work many imaginary perfections in laws, politics, &c., in contradistinction to the defects of those which then existed.

UTRAQUISTS. See CALIXTINES.

UTRECHT, an important town of Holland, capital of a province of the same name, 23 miles south-east of Amsterdam. It lies in a pleasant district, on a somewhat elevated site on the Old Rhine, where the Vecht branches off from it, and is traversed by two canals, across which are numerous stone bridges. It is an open, well-built town, with numerous squares, and five public promenades. Utrecht possesses a government-house, a Protestant cathedral, national mint, town-hall, the finest building in the town, the buildings of the Society of Art and Science, several barracks, an arsenal, and numerous remains of antiquity. There is here a university, with a botanical garden, anatomical hall, laboratory, observatory, library, and a museum of natural history attached; a veterinary school, musical college, schools for drawing and architecture, and numerous other educational establishments. Utrecht is the central point of the Dutch railway system, and is well situated for trade both by land and water. It carries on an extensive trade in grain and cattle, and in the manufactures of the place, which include soda, sulphuric acid, ultramarine, bone-black, tobacco and cigars, iron-castings, beer, the kind of plush called Utrecht velvet, carpets, floor-cloth, salt, &c. Utrecht is the oldest town of Holland, and was called by the Romans *Trajectum ad Rhenum*, that is, 'Ford of the Rhine,' and later *Ultratrajectum*. In the audience-hall of the university, in 1579, was signed the act of confederation, declaring the seven United Provinces independent of Spain; and in the British minister's house, now replaced by a barrack, the Peace of Utrecht was signed in 1713, which ended the war of the Spanish Succession. (See *UTRECHT, PEACE OF*.) Pop. in 1900, 104,194.—The province of Utrecht is the smallest in the kingdom, having only an area of 532 square miles, with a pop. of 254,867 in 1900. It is generally flat, is well watered by the Rhine, Vecht, Amstel, &c., and is better suited for dairy-farming and stock-rearing than for corn-growing.

UTRECHT, PEACE OF, a peace which consisted of a series of separate treaties between the powers who had been engaged in the war of the Spanish Succession. The emperor refused to accede to the peace, and his differences with France were subsequently adjusted by the Treaty of Rastadt, 7th March, 1714, for his own dominions, and of Baden, 7th September, 1714, for the empire. (See *GERMANY—History*.) On April 11, 1713, England, the States-general, Prussia, Portugal, and Savoy, signed separate treaties with France. By the treaty with England, France, among other things, recognized the Hanoverian succession, engaged that the crowns of France and Spain should never be united, agreed to the restitution of conquests to the allies of England, engaged that the fortifications of Dunkirk should be razed; and ceded to Britain Nova Scotia, Newfoundland, St. Kitts, and Hudson's Bay and Straits. Gibraltar and Minorca were also ceded on behalf of Spain. France ceded to Holland all that part of the Spanish Netherlands still held by her, which was to be handed over to Austria when a barrier treaty was arranged. (See *BARRIER TREATY* and *GERMANY*.) Portugal acquired some colonial accessions. Louis XIV. recognized the title of the King of Prussia, and on behalf of Spain ceded to him Spanish Guelderland, except Venloo and Roermonde. Prussia also acquired the sovereignty of Neuchâtel in Switzerland, and renounced the principality of Orange with its dependencies. Savoy and Nice were restored to the Duke of Savoy, who was recognized as presumptive

hair to the Spanish monarchy, and received an accession of territory with the title of king. The different powers concerned in the treaties with France could not enter into direct negotiations with Spain, as Philip V. was not recognized till the conclusion of the treaties; but France treated for Spain, and formal treaties with that power corresponding with those with France were signed by Britain, 13th July, 1713; Savoy, 13th August, 1713; Netherlands, June 26, 1714; and by Portugal, February, 1715.

UTTOXETER, a market-town and urban district of England, Staffordshire, 14 miles E.N.E. of Stafford, on an eminence above the vale of the Dove. It is clean and well built; has a handsome parish church, and several other places of worship,

and a grammar-school; and carries on malting, iron-founding, agricultural-implement making, and brewing. Pop. (1891), 4418; (1901), 5133.

UVULA. See PALATE.

UXBRIDGE, a market-town of England, in Middlesex, 15 miles west by north of London, on the left bank of the Coln, here crossed by two good bridges, and on the Great Western Railway. It is well built, contains an ancient church, built of flint and brick; two new churches, several Dissenting chapels, and a spacious corn-exchange. There are iron-foundries, a brewery, corn-mills, &c. Brick-making is carried on on a large scale, and there is an extensive traffic in corn and flour. Pop. in 1881, 7669; in 1891, 8206; in 1901, 8585.

## V.

V, the twenty-second letter of the English alphabet, a labial, formed by the junction of the upper teeth with the lower lip, and a gentle expiration. It resembles the letter *f*, but in pronouncing it the teeth are pressed less tightly to the lip, and the sound is voiced or sonant, *f* being surd or mute. In Anglo-Saxon there was no letter *v*, but *f* often had this sound. In Latin, V and U were one letter. (See U.) As a numeral V denotes 5, or with a dash above it, V̄, 5000.

VAAL RIVER. See ORANGE RIVER.

VACCINATION (from the *vaccine* virus or matter characteristic of the disease *vaccinia* or cow-pox, from *L. vacca*, a cow) is the process or operation by which the human subject is inoculated (vaccinated) with the lymph or matter of cow-pox, usually artificially produced, with the view of protecting the individual treated against an attack of the far more serious small-pox. The ravages of small-pox before the introduction of vaccination have been referred to under INOCULATION and SMALL-POX; and an account of the discovery that cow-pox when communicated to man rendered him as insusceptible to an attack of small-pox as an attack of small-pox itself did, together with the fact that cow-pox might be easily communicated from person to person by inoculation, has been given under JENNER. There are several different methods of performing the operation of vaccination, the essential point of each being the introduction of the vaccine lymph into the circulation. The spot generally selected is the outside of the arm just below the shoulder, and here four or more small incisions are made. Some surgeons make a few small straight cuts in the skin with a sharp lancet well charged with lymph; others make a number of parallel or crossed scratches with a charged lancet; while Dr. Seaton, who was the medical officer to the Local Government Board and one of the chief authorities on this subject, recommended as the most effective method the plan of making a number of small punctures on the spots selected, over which the lymph should be spread with the flat part of the lancet. He further advised that when the vaccination was performed on both arms there should be three insertions of lymph on each, while if it was confined to one, five insertions should be made on that arm. In ordinary cases, after the lymph is inserted, no particular effect is observed till about the end of the second day, or early on the third day, when the skin at the spot

becomes slightly elevated, hard, and red. This elevation by the fifth day has become a distinct vesicle, bluish-white in colour, with a raised edge and central cup-like depression. It is distended with clear lymph, and by the eighth day it attains its full development; the vesicle being plump, round, more decidedly pearl-coloured, the margin being firm and the central depression very marked. On this day, and sometimes a little earlier, a ring of inflammation called the *areola* begins to form about its base, and both vesicle and areola continue to spread for the next two days. After the tenth day the areola begins to fade, the pustule also commencing to dry in the centre, until by the fourteenth or fifteenth day a hard brown scab is formed, which usually falls off about the twenty-first day, but which may remain a day or two longer. It leaves a cicatrix or scar which is usually permanent in after-life, generally of circular shape and somewhat depressed. The constitutional symptoms are usually a slight rise of temperature, increasing to obvious feverishness, with derangement of the stomach and bowels, between the eighth and tenth day, and occasional swelling of the glands of the arm-pit, these symptoms subsiding as the areola disappears. Sometimes slight skin eruptions also appear when the areola is at its height; but these, together with the general symptoms, are usually slight in intensity, and seldom call for special treatment. While the punctures are healing there is a good deal of itching, and it is a good plan to cover them with a soft piece of clean linen, thickly spread with cold cream, which may be kept in its place by means of a layer of cotton-wool and a suitable bandage.

With respect to the age at which children should be vaccinated, it is generally maintained that since small-pox is a disease to which persons are liable from birth, and which is peculiarly fatal in infancy, it is important that vaccination should be performed very early in life. Plump and healthy children should be vaccinated when a month or six weeks old; more delicate children may be kept waiting for three or four weeks more; but all, except where the state of health positively forbids vaccination, should be vaccinated by the age of three months—the age formerly in England laid down by law. In the case of 'arm-to-arm vaccination', which, however, is now becoming obsolete, the lymph for vaccination should be taken from perfectly healthy subjects and from thoroughly characteristic vesicles, the best time

to take it being the eighth day, the vesicle being uninjured and free from areola. The latter circumstance is important, and of still greater importance is the rule to reject all lymph with which even the slightest quantity of blood has been drawn. Calf lymph, lymph obtained from calves specially selected and vaccinated for the purpose, is now widely employed, its effects being apparently in no respect different from those of the best human lymph. The lymph is usually kept in fine glass tubes. Latterly what is known as 'glycerinated calf lymph' is the special sort made use of, which Lord Lister has described as removing the last 'rational objection which could be urged against vaccination'. The glycerine kills off various microbes that were apt to get into the vaccine lymph, and also increases its efficiency, while it reduces the inflammatory and febrile disturbances attending the vaccination.

In the early days of vaccination it was supposed that the operation, when properly performed, would protect the subject against small-pox for life, though Jenner never claimed for it more protective power than that afforded by an attack of the disease itself, and it is known that a person may have more than one attack of the small-pox. But experience has shown that in the majority of cases revaccination about the age of twelve years is necessary, and that it may be desirable to resort to it afterwards whenever there is any risk of infection. In small-pox hospitals it is customary to vaccinate the nurses, whether they have been previously vaccinated or not, before they enter upon their duties; and many doctors submit to the operation whenever they have to combat an epidemic of the disease, the immunity of both doctors and nurses being most remarkable. With respect to the value of vaccination as a protection against small-pox, the defenders of the practice, among whom are included the vast majority of the medical profession, British, Continental, and American, contend that it is manifested in two ways: first, by the immunity from the disease, which, as a rule, it confers; secondly, by the modification which, when immunity is not complete, it induces in the course and severity of the disease in the majority of cases. Statistics derived from the experience of the small-pox hospitals of London go to prove that while the disease runs an unmodified course in all but 2·6 per cent of the unvaccinated patients, its course in vaccinated patients is modified in 73 per cent; and that while the death-rate of natural small-pox is 35·55 per cent, that of post-vaccinal small-pox is not more than 8 per cent. The difference between 35 and 8, however, does not give a fair idea of the protection afforded by vaccination, as in many cases the vaccination was proved to have been of a very imperfect character. Statistics recently collected of 11,724 cases of small-pox treated in the hospitals of the Metropolitan Asylums Board showed that in 4477 cases having good vaccination marks there were 183 deaths—mortality per cent, 4·1; while in 7247 cases having indifferent marks the mortality was 799, or at the rate of 11 per cent. Many similar statistics have been collected elsewhere.

That some disadvantages—or even dangers—attend vaccination need not be altogether denied, but these in recent practice may be said to be altogether obviated. Syphilis, it is alleged, has been conveyed to healthy persons through this operation, and erysipelas is also said to have been brought on by it; but such cases have been very rare, and the practice of vaccination is now almost universal in civilized countries—in some of them being compulsory. Compulsion was introduced in England in 1853, and in Scotland and Ireland in 1868. A con-

solidating and amending act was passed in 1867, this being slightly amended by an act of 1871. Provision was thus made for the appointment and payment of public vaccinators throughout the kingdom, and for the due registration of the operation. It was enacted that in England all children must be vaccinated within three months of their birth, under a penalty of 40s., unless any public vaccinator or medical practitioner should certify in the case of any particular child that it was not in a fit state to be vaccinated. The limit of age for Scotland was fixed at six months. The payment of the penalty was not to release the parent or guardian from compliance with the law, and it could be enforced at due intervals till obedience was rendered. The law gave rise to an outcry among ignorant and prejudiced persons, and many suffered imprisonment rather than comply. This feeling manifested itself with special vehemence at certain centres of population, and in some towns such a strong anti-vaccination movement arose as led to a wholesale disregard of the vaccination laws. Among towns where this movement had the greatest success were Leicester and Keighley, where the anti-vaccinators were so numerous that the law was practically defied. Every year the number of unvaccinated children increased, and a government inquiry was at last brought about.

A royal commission to inquire into the working of the vaccination acts was appointed in 1889, and the commissioners issued their final report in 1896. In 1892 they had issued an interim report recommending that the imposition of repeated penalties in respect of non-vaccination should cease. In the final report the commissioners, by a majority of eleven out of thirteen, gave as among their conclusions that vaccination has a protective effect, diminishing the liability to attack and mitigating the severity of the disease; that the beneficial effects of vaccination are greatest in those cases in which the operation has been most thoroughly performed; that the protection is greatest during the nine or ten years following vaccination, after which it rapidly diminishes, though it never wholly ceases; that revaccination restores the temporary protection; that diseases, as alleged, have resulted from vaccination, but only to an insignificant extent as compared with the total number of vaccinations, and are diminishing under the better precautions now adopted. They recommended the use of calf lymph as affording absolute protection against the communication of disease; that the vaccination age should be extended to six months; and objected to the imposition of repeated penalties. Some of these recommendations were embodied in the act of 1898, according to which, while it is still the law that all children born in England (the act does not refer to Scotland) must be vaccinated within six months of their birth, no parent is liable to any penalty for non-vaccination, if within four months from the birth of the child he satisfies two justices of the peace, or a stipendiary magistrate, that he conscientiously believes that vaccination would be prejudicial to the health of the child, and obtains a certificate of exemption. Vaccination may be performed either by a private practitioner or by a public vaccinator, it being the duty of the latter, when called upon, to visit the home of the child and vaccinate it free of charge. A parent can only be prosecuted twice for non-vaccination in the case of the same child, and the second time not till it is four years old. Since every birth must be registered, and certificates of vaccination have also to be forwarded to the registrar, cases of non-compliance with the law are easily detected and dealt with.

Among works in favour of vaccination are M'Vail's *Vaccination Vindicated*, Buiet's *Vaccination and Variola*, Hart's *Truth about Vaccination*; against it, Creighton's *Jenner and Vaccination*, and Natural History of Cow-pox, Crookshank's *History and Pathology of Vaccination*.

**VACUUM**, an absolutely empty space; an inclosed space in which the tension of the occupying gas is very small compared with the ordinary tension of the atmosphere outside the inclosure. The best-known vacuum is the vacant space above the mercury in a barometer, called Torricelli's vacuum. This space is not absolutely empty, because there is vapour of mercury filling it, probably also the glass of the tube gives off a vapour having a very small tension at ordinary temperatures. Very elaborate experiments have been devised to produce what are called perfect vacuums, and air and other gases have been very perfectly removed from glass vessels; but even if we did not believe in the existence of the ether necessary to the undulatory theory of light, what we surmise as to the evaporation of bodies at all temperatures would lead us to the belief that an absolute vacuum has not yet been produced.

**VACUUM-TUBES**, glass tubes containing different gases much rarefied, and having inserted two pieces of platinum wire (platinum and glass contract nearly at the same rate in cooling), by means of which sparks from a Ruhmkorff's coil may be passed through the gas. The colours and stratification produced by electrical discharges in these tubes are very beautiful and interesting. Vacuum-tubes are also called Geissler's tubes, from Geissler of Bonn, an eminent maker. An egg-shaped glass vessel, called 'electric egg', is used similarly. The colours depend on the particular gas inclosed in the tube; with air the colour is purple or red at the positive end, and blue or white at the negative end. In hydrogen the light is green, in ammonia it is blue, and in sulphurous acid it is lilac. There are also Crookes and Röntgen tubes, for which see RADIOGRAPHY in SUPP.

**VADUZ**, capital of the principality of Liechtenstein, on the right bank of the Rhine, 14 miles S.W. of Appenzell. It is finely situated at the foot of a hill, in a district where much fruit is grown. It has an interesting old castle, restored in the sixteenth century, with a square tower dating from the ninth century. Pop. in 1890, 1139.

**VAGRANTS**, a class of persons of which the English law takes cognizance, the statutes dividing them into the three grades of *idle and disorderly persons*, *rogues and vagabonds*, and *incorrigible rogues*. Idle and disorderly persons are such as, while able to maintain themselves and their families, neglect to do so, pedlars or chapmen trading without a license, persons begging or encouraging children to beg, &c. They may be sentenced to imprisonment with hard labour for not more than a month. A rogue and vagabond is one who, having been convicted as an idle and disorderly person, is again guilty of the same offence; so persons pretending to tell fortunes or practising any other sort of imposition, persons having no visible occupation and unable to give a good account of themselves, or exhibiting wounds in order to obtain alms, or playing or betting in public with a table or other instrument of gambling, and other similar cases. This second class of offenders may be imprisoned with hard labour for not more than three months. A convicted rogue and vagabond on repetition of the offence renders himself liable to punishment as an incorrigible rogue; that is, he may be committed to prison with hard labour till next quarter-sessions, and may then be imprisoned with hard labour for a

year, whipping being added according to the pleasure of the justices. In Scotland, vagrants are chiefly dealt with by local enactments.

**VAIGATCH**, an island in the Arctic Ocean, belonging to the Russian government of Archangel, separated from the mainland by the Yugor Strait and from Nova Zembla by Kara Strait, and forming with Nova Zembla the western boundary of the Kara Sea. The mountain chain of the adjacent mainland peninsula is continued in the island by a low chain near the east coast. Vegetation is very scant, but the island is visited by Russians and Samoyedes in search of fur-bearing animals, whales, various kinds of birds, and fish. The area is about 1410 square miles.

**VALAIS** (German, *Wallis*), a southern canton of Switzerland, abutting on France and Italy, and having an area of 2026 square miles. It is surrounded on all sides by the loftiest and most magnificent mountain chains in Europe, namely, by the Bernese, Pennine, and Helvetic or Lepontine Alps, all containing ridges 13,000 to 15,000 feet high, with magnificent glaciers. The Rhone flows through the whole length of the canton, forming the largest valley in Switzerland, and discharges into the Lake of Geneva. Where the elevation is not too great the mountain-slopes are covered with large and valuable forests of pines, and lower down of hard-wood trees, succeeded by productive orchards; rich pastures abound, and support numerous cattle, the principal source of subsistence of the inhabitants. In the lower valley of the Rhone there is much arable land, the finer fruits are grown, and silk-worms reared. The canton produces a good deal of wine. In the Upper Valais, German, in the Lower, French is spoken. The canton was admitted into the Confederation in 1553. Sion is the capital. Pop. in 1900, 114,980, of whom only a small number were Protestants.

**VALDAI HILLS**. See RUSSIA.

**VALDEPENAS**, a town in Spain, province of Ciudad-Real, 110 miles south of Madrid. It is celebrated for a wine derived from the Burgundy vine introduced from France. Pop. (1887), 15,404.

**VAL DE TRAVERS**, a valley of Switzerland, in the canton of Neuchâtel, in the Jura Mountains to the west of Neuchâtel Lake, about 12 miles south-west of the town of Neuchâtel. It is about 7 miles long, and is drained by the river Reuse, flowing north-east to the lake. The inhabitants are engaged in agricultural and pastoral occupations and in the manufacture of clocks, liqueurs, lace, and especially cement and asphalt, for which the valley is famous. The chief villages are Fleurier, Môtiers, Couvet, and Travers, with a total population of about 9000. The valley is traversed by a railway from Dijon to Neuchâtel.

**VALENCE**, a town in France, capital of the Department of Drôme, on the left bank of the Rhone, 66 miles south of Lyons. It contains a small ancient cathedral in the Romanesque style, with a bust by Canova of Pope Pius VI.; a public library of 20,000 volumes, several higher educational institutions, a museum of antiquities and paintings, a handsome court-house, and a theatre. It is the see of a bishop, and has a court of first resort. Its chief manufacturing industries are cloth-printing, brewing and distilling, tanning, and hardware-making; and it has a trade in timber, grain, coal, silks, and wine. Pop. (1896), 26,212.

**VALENCIA**, a city of Spain, capital of a province of the same name, on the south bank of the Turia or Guadalquivir, over which several bridges lead to northern suburbs, near the eastern coast, 190 miles S.W. of Madrid. It stands in a fertile district and has an attractive and somewhat Ori-

ental appearance, and its streets are mostly narrow and winding. The city walls were removed in 1871, and their site is now occupied by broad boulevards, but two old gates have been left in position. The chief square is the Plaza del Mercado, or market-place, on the north side of which is the Lonja de la Seda, or silk exchange, a beautiful Gothic building of the fifteenth century, restored in 1892-95. The other noteworthy buildings and institutions of the city are: the cathedral (La Seo), completed in 1482, with an octagonal Gothic bell-tower called El Miguelete; the Colegio del Patriarca, an ecclesiastical building in Renaissance style (1586-1605), containing a church of Corpus Christi, pictures, frescoes, tapestry, &c.; the church of San Nicolas, with fine paintings by Juanes; the university, founded in 1441, with a valuable library; the Audiencia, formerly the chamber of deputies of the kingdom of Valencia, a sixteenth-century Renaissance edifice; the provincial picture-gallery, strong in the Valencian school; the citadel, built by Charles V., now in ruins; the provincial and the military hospital; the penitentiary; the archiepiscopal palace; &c. The fine botanical garden, the bull-ring, a theatre, and some other buildings are situated outside of the boulevard line; and on the north side of the river is the charming Alameda, lined with plane-trees. El Grao, the harbour, is at the mouth of the Turia, on the north side, and beside it are sea-bathing resorts. Valencia has manufactures of silk, cigars, paper, oil, chocolate, soap, &c., and a considerable trade in wine, oranges, rice, oil, &c. Valencia figured in Roman history, and was destroyed by Pompey in B.C. 75. It was long the capital of a kingdom of Valencia, which came to an end in 1319. In 1812-13 it was occupied by the French under Suchet. Pop. (1897), 204,768; of province, 775,995.

**VALENCIENNES**, a town of France, in the department of Nord, at the junction of the Rhon-delle with the Scheldt, 30 miles south-east of Lille. Its chief buildings and institutions are: the church of Notre Dame du St. Cordon, a modern edifice in thirteenth-century style, with fine stained-glass windows; an old Gothic church, with a modern tower; the town-hall, a seventeenth-century building, with a façade of more recent date; a lyceum; a museum of painting and sculpture, rich in works of the Flemish school; a natural history museum; a municipal library; a civil and a military hospital; an arsenal, and barracks. The district yields much coal, and among the manufactures of the town are chicory, beet-sugar, salt, potash, soap, glass, iron, woollen yarn and goods, linen, &c. The once flourishing lace industry is now extinct. Pop. in 1901, 81,007.

**VALENS**. See **ROME**—History.

**VALENTIA**, or **VALENCIA**, a small island off the south-west coast of Ireland, belonging to the county of Kerry. It is about 5 miles long by 2 miles broad, mostly fertile and under tillage, and possesses valuable slate and flag quarries and productive fisheries. The village of Valentia, at the south-east extremity of the island, has some trade in slates, flags, fish, and agricultural produce. Valentia is the point from which the British Atlantic telegraph cables start to Newfoundland. Pop. in 1891, 2050.

**VALENTINE**, Sr., a saint of the Roman calendar, whose day is February 14. The custom of choosing valentines on his day is of considerable antiquity, and it was an old belief that birds began to mate on this day. On the eve of St. Valentine's day young people of both sexes used to meet, and each of them drew one by lot from a number of names of the opposite sex, which were put into a

common receptacle. Each gentleman thus got a lady for his valentine, and became the valentine of a lady. The gentlemen remained bound to the service of their valentines for a year. A similar custom prevailed in the Roman Lupercalia, to which the modern custom has, with probability, been traced. The practice has fallen into desuetude. The day used commonly to be celebrated by sending, anonymously through the post, missives specially provided by the stationer for the purpose. These were either of a sentimental or of a ludicrous character, the latter class generally being intended to convey, either seriously or in fun, depreciatory sentiments regarding the recipient's personal appearance, habits, &c. The valentines of the serious class were sometimes very elaborate affairs, costing perhaps five or six pounds. This practice has all but ceased.

**VALENTINIANS**. See **GNOSTICS**.

**VALERIAN**, the common name of plants of the genus *Valeriana*, type of the order Valerianaceæ of sympetalous dicotyledons, closely related to Compositæ. Among the principal distinguishing characteristics of the order are: calyx superior; corolla of usually five united petals, often spurred; stamens 1-4, with free anthers; ovary of three united carpels, only one of which is fertile, containing a single pendulous ovule; seeds exalbuminous; embryo straight; leaves exstipulate; flowers in dichotomous cymes. The order includes eight genera; among the species being spikenard (*Nardostachys jatamansi*) and lamb's lettuce (*Valerianella diotria*). The species of *Valeriana* are shrubs or herbaceous plants with pinnate, opposite leaves, three stamens, corollas without spurs, fruit almost always one-celled, and calyx mostly appearing as a pappus after flowering. They number about 150. The chief British species are *V. officinalis*, a tall plant with white or pinkish flowers, abundant in moist places, and *V. dioica*, a smaller species. The root of the former yields a well-known antispasmodic medicine, useful in hysteria, flatulence, palpitation, and convulsions. Cats are extremely fond of it.

**VALETTA**, a fortified seaport, capital of Malta, on the north-east coast of the island, picturesquely situated on an elevated peninsula, with a large and commodious harbour on each side. The town and both harbours are defended by walls and forts of great strength, partly built in the solid rock. The streets are narrow, the squares are spacious and handsome, and the splendid quays, lined with elegant buildings, are particularly attractive. From the inequality of the site the communication between the different streets is maintained by flights of steps. Among the churches the most notable is the cathedral, built in 1580, containing the tombs of the knights, who are represented in white marble in full costume. The governor's residence, the ancient palace of the grand-masters, has a corridor hung with portraits of knights, and an armoury rich in trophies and ancient armour. There is a library and museum and a university, a botanical garden, a military hospital, occupying a noble building erected by the knights, and other public institutions. There are several dry-docks, one of very great size, and the town is an important coaling station. It has a stone quarry, silk-factories, a large transit trade, and is the chief station of the British fleet in the Mediterranean. Pop., including suburbs, estimated at 70,000.

**VALHALLA**. See **NORTHERN MYTHOLOGY**.

**VALKYRIAS**. See **NORTHERN MYTHOLOGY**.

**VALLADOLID**, a city of Spain, capital of a modern province of the same name, and seat of an archbishop, on the left bank of the Pisuerga, a tributary of the Douro, which is here joined by the

**Esgueva** (largely covered in) from the east and the Canal of Castile from the north, 110 miles north-west of Madrid. It is situated in a spacious, fertile plain, and has fine streets and squares, among the latter being the Plaza Mayor (or de la Constitucion), the centre of the city's life. The most notable church is the cathedral, begun in late Renaissance style in 1585, but still unfinished; and the most interesting church is that of Santa Maria la Antigua, dating from the twelfth century. Close to these two edifices stands the university, a seventeenth-century building, with a library. Other noteworthy buildings and institutions are: the Colegio de Santa Cruz, a splendid plateresque building of the fifteenth century, containing a museum and some modern paintings; the Colegio de San Gregorio, a fifteenth-century building, now devoted to municipal purposes, with a splendid Gothic facade; the thirteenth-century church of San Pablo, with an ornamental Gothic facade; the royal palace, dating from the seventeenth century; the convent of San Benito, now used as a barrack; two theatres; a bull-ring; general hospital; &c. The Campo Grande is the finest park of the city. The industries include iron-founding and manufactures of cloth, silks, paper, gold and silver wares, chemicals, and leather. Valladolid was the capital of Spain before Madrid. It is the birthplace of Philip II., and it contains the house in which Columbus died. One of the foreign institutions for the training of Scottish Roman Catholic priests was formerly situated here. Pop. (1897), 68,746.—The province has an area of 3043 square miles, and a pop. (1897) of 276,366.

**VALLADOLID**, a city of Mexico, in the state of Yucatan, finely built, and containing numerous churches, a Jesuit college, a hospital, and a fine aqueduct. It has a cotton industry. Pop. 14,000. See also MORELIA.

**VALLIÈRE, LOUISE.** See LA VALLIÈRE.

**VALLISNERIA**, a genus of plants of the natural order Hydrocharitaceae, or floating plants. The *Vallisneria spiralis* is found in still waters in Italy and France. It presents partly submerged fields of narrow, linear, three-nerved, grass-like, olive-green leaves. The male and the female flowers are produced upon different plants. The former have short stalks, while those of the latter are long and spirally twisted. When the time of fecundation arrives the male flowers become detached and rise to the surface, where they are enabled to fertilize the female flowers, whose long spiral stems enable them to float on the surface even at a variable depth. After fecundation the female flowers are drawn under water by the contraction of their spiral stems, and there ripen the seed. This plant is extensively used in aquaria.

**VALLOMBROSA** ('Shady Valley'), an Italian abbey in the Apennines, some 18 miles east by south of Florence, surrounded by forests. Here an order of monks was established in 1038, subject to the rule of St. Benedict, called the *order of Vallombrosa*. There is now a school of forestry in the building, but some monks still reside here and attend to a meteorological observatory. The place is much visited on account of its scenery and the fine views to be had, and there are hotels for the accommodation of visitors. Milton's reference to the 'autumnal leaves that strew the brooks in Vallombrosa' is well known.

**VALOIS, HOUSE OF.** See FRANCE—History.

**VALONIA**, an important substance, used chiefly in tanning operations, the acorn-cup of the *Quercus agrilops*, brought from the Levant. See TANNING.

**VALPARAISO**, the principal port of Chili, capital of the province of Valparaiso, situated on a

large bay of the Pacific, 60 miles w.s.w. of Santiago. The bay is open to the north, but well sheltered from winds in other directions, and is capable of accommodating a very large number of vessels. The town rises in an amphitheatre, and its general aspect is that of an English colonial town, but the buildings are not handsome, and except the public offices there is hardly any public building worthy of note. It contains arsenals, shipbuilding yards, and a naval college. There is communication by railway with Santiago, the capital. The importance of Valparaiso is exclusively mercantile, it being the great commercial emporium of Chili. The population consists largely of foreigners attracted by the commercial advantages of the place. The principal imports are manufactured goods, coal, sugar, wine, and tobacco and cigars. A large portion of the exports consists of agricultural produce (wheat, barley, wool, &c.), the remainder of mining produce. The total value of imports and exports in 1900 was £6,892,662, or less than the total for Iquique by some £300,000, and rather less than a third of the total trade of Chili. Pop. (1899), 143,022.

**VALPY, RICHARD**, schoolmaster, was born in Jersey on Dec. 7, 1754. He was educated in Normandy, at Southampton grammar-school, and at the grammar-school of Guildford, and in 1773 he entered Pembroke College, Oxford, where he graduated in 1776. He took orders in 1777 and proceeded M.A. in 1784 and D.D. in 1792. After acting for a few years as second master in the school of Bury St. Edmunds he became head-master of Reading grammar-school in 1781, and he occupied this position with great success till his retirement in 1830. He was collated to the rectory of Stradishall in Suffolk in 1787, and he is said to have twice refused a bishopric. He died in Kensington on March 28, 1836. He published a volume of verse (*Poetical Blossoms*, 1772), various Greek and Latin school-books, a poetical chronology of history, and other works. His youngest son, FRANCIS EDWARD VALPY (1797–1882) succeeded his father in the headmastership of Reading school in 1830 and was afterwards master of Burton-on-Trent school. His second son, ABRAHAM JOHN VALPY, born in 1787 and educated in Reading school, graduated from Pembroke College in 1809. He set up in business in London as a classical printer and editor, but in 1837 he sold his stock and retired. He started the *Classical Journal* in 1810 and conducted it till 1829, and among the chief productions of his press were a reissue of Stephens's *Thesaurus Lingue Græcæ* (1816–28) and a reissue of the *Delphin Classics* (1819–30). He died in London on Nov. 19, 1854. A brother of Richard, EDWARD VALPY (1764–1832), became master of Norwich grammar-school in 1810. He was author of *Elegantie Latine* (1803), and issued an edition of the Greek Testament, with notes.

**VALUE.** Adam Smith notes that value 'has two distinct meanings, and sometimes expresses the utility of some particular object, and sometimes the power of purchasing other goods which the possession of that object conveys'. In reality there are three distinct things signified by the term value, all of which are the subject of discussion in political economy: inherent utility, cost of production, and purchasing power. These three things, as generally recognized by economists, are distinct, and require to be represented by distinct terms; but it is equally true, though not equally recognized, that they have also in common a fundamental property which requires to be represented by a common name, and to which the term value has been assigned in established usage. The fundamental sense of value is utility estimated or measured by some standard; the mean-



ing of the term value therefore varies with the standard implied. The standard professedly established by economists is power of purchase, but the attempt to make this the exclusive standard of value is an unfortunate one, as cost of production and practical utilities of various kinds require to be discussed in political economy as standards of value, and no other form of expression can be correctly applied to them in consistency either with common usage or with the use made of the term value as applied to purchase by political economists themselves, who are, therefore, frequently led to violate their own definition. The value, for example, of any commodity to the producer is the cost of its production, as that is the price at which he procures it; the market value, or price at which he sells it, is different, but no good reason can be given for calling one of these a value and the other not.

**VAMPIRE.** There is a superstition, somewhat analogous to the ghouls legends of the Persians and Arabians, prevalent in the east of Europe concerning the reappearance of certain persons after death, who are called vampires (Servian, *vampir*). Greece, Hungary, Moravia, Silesia, Poland, and Russia are countries where this belief prevails. A vampire is the ghost or spirit of a person who has been for some time dead, but who shows symptoms of vitality as he lies by day in his grave, and at night issues forth and sucks the blood of living persons, particularly of the young and healthy, causing them to pine away and die. Vampires especially favour their friends and relatives with their visits, and any one whose death is caused by a vampire becomes a vampire. Among the Greeks the superstition has been so far modified by Christianity that the original vampires are supposed in many cases to be excommunicated persons, who are kept alive by the devil, and who procure their food in this and other unlawful ways. Where the belief in vampires prevails, when a person dies a careful examination is made by a skilled person lest he should have been killed by a vampire and so be liable to become one; if this is suspected, the body may be pierced with a stake cut from a green tree, the head cut off, and the heart burned. This is also the process for destroying the vampire spirit in a corpse believed to be already a vampire.

**VAMPIRE-BAT**, a genus of Chiroptera or Bats, belonging to the family Phyllostomidae. These bats are included in the division of Insectivorous or Carnivorous Bats, and are distinguished by possessing large leaf-like nasal appendages. The ears are of small size. The teeth number four incisors in the upper jaw and six in the lower jaw; two canines in each jaw; and twelve molars above and ten below—making a total of thirty-four teeth in all. The incisors are small and the canines large. (See PL. at CHEROPTERA, fig. 9.) They are confined in their distribution to South America. The Vampire-bat is scientifically known as the *Vampyrus* or *Phyllostoma spectrum*. The body and tail do not attain a great size, averaging about 6 or 9 inches in length; but the spread of the wing-membrane may measure over 2 feet. The body is covered with a light-brown fur. This species is now known to be entirely innocent of the blood-sucking which was formerly attributed to it, but it has been established beyond all question that certain other species are true vampires. Darwin gives an instance of a Vampire-bat attacking a horse in Chili during the night, the servant, on hurrying out to ascertain the cause of the restiveness of the animal, discovering a bat on its withers. The bite exhibited tenderness and irritation for some days thereafter, but no bad results followed from the injury. Bates and Wallace were

themselves bitten by bats during their famous Amazon journey, and other travellers have confirmed the evidence of these naturalists. The guilty species are now known to be *Desmodus rufus* and *Diphylla ecaudata*, which constitute a peculiar group characterized by a striking dentition of a distinctly sanguivorous type. See the works of the above-mentioned naturalists and of other South American travellers.

**VAN**, a town and lake of Asiatic Turkey, on the borders of Armenia and Kurdistan. The town, 145 miles south-east of Erzerum, is close to the east shore of the lake, and is the capital of a vilayet of the same name. It stands on an extensive plain covered with beautiful gardens; overlooking it is the citadel, in a ruinous condition, crowning a lofty calcareous height. Cotton cloth is the only staple article both of manufacture and export. Pop. 30,000 to 35,000.—The lake, situated at a height of 5200–5460 feet above sea-level, is of very irregular shape, contains many islands, and has an area variously estimated at from 1200 to 1500 square miles. Its water is salt, but becomes only brackish near the mouths of the streams. It has no visible outlet. A kind of sardines, which are salted and exported to all parts of Asia Minor, are caught in it.

**VANADIUM**, the name of a metal discovered in 1830 by Sefström. It is found, among other localities, in vanadate of lead from Wanlockhead, in Scotland, and in the copper-bearing sandstones of Cheshire. Metallic vanadium is obtained by heating pure dichloride to redness in a stream of perfectly dry hydrogen. From the great readiness with which the reduced metal combines with oxygen it is very difficult to obtain it perfectly free from oxide. Indeed, it has been shown by Roscoe that the substance which was generally believed to be metallic vanadium is really an oxide of that metal, and that the atomic weight assigned to vanadium by the older chemists must be altered. The atomic weight of vanadium is now taken to be 51.2; its symbol is V. Metallic vanadium is a white, shining, silver-like crystalline metal. It does not undergo any change in air at ordinary or at moderately high temperatures. Powdered vanadium, when thrown into a flame, burns brilliantly, forming pentoxide,  $V_2O_5$ . Vanadium forms three basic oxides,  $V_2O$ ,  $V_2O_3$ ,  $V_2O_4$ , and two acid oxides,  $V_2O_4$  and  $V_2O_5$ . The last of these is the most important, and is prepared from the mottamite of the Cheshire Keuper sandstones, which has the formula  $(PbCu)_2(VO_4)_2 + 2PbCu(HO)_2$ . The mineral is acted on by hydrochloric acid and the solution concentrated and evaporated with ammonium chloride, so as to form ammonium metavanadate,  $NH_4VO_3$ . From this salt, when freed from metallic impurities, the pentoxide of vanadium is obtained by roasting. It crystallizes in red prisms, and may be reduced to the trioxide by hydrogen. It forms several series of salts, known as vanadates, and distinguished by the prefixes meta-, ortho-, pyro-, tetra-, hexa-. *Vanadium bronze*, which is used as a pigment, consists of metavanadic acid, which may be obtained in the form of yellow or orange crystals by acting on copper metavanadate with sulphurous acid. Ammonium metavanadate is a colourless or white substance used in making aniline black, and *vanadium ink* is prepared from it by adding gum water and gallic acid.

**VANBRUGH**, SIR JOHN, a celebrated English architect and dramatist, born in 1664. He was well educated, partly in England, partly in France, entered the English army in 1686, and from 1690 till 1692 was a prisoner in France, being latterly confined in the Bastille. He acquired his knowledge of architecture during his earlier residence in France. His first play, *The Relapse*, was brought



out at Drury Lane in 1697. *Æsop*, founded on a French original, followed at a short interval, and in May of the same year his play of *The Provok'd Wife* was performed. In 1700 he adapted Beaumont and Fletcher's comedy of *The Pilgrim*. In 1702 he designed Castle Howard, the seat of the Earl of Carlisle, who presented him with the tabard of Clarenceux king-at-arms. He now entered into a speculation to build a great theatre at the west end of London, in which he was his own architect. Both plays and operas were produced; but it did not prove a success. He wrote for it the *Confederacy*, and adapted some of Molière's comedies. In 1706 he received a commission from the queen to present the garter to the Elector of Hanover. By this time he was occupied with the erection of Blenheim Palace for the Duke of Marlborough. This work got him into considerable pecuniary trouble, as the money supplies, provided out of the civil list, were latterly stopped, and heavy claims were made against him. Ultimately the duchess took the work out of his hands, and he had difficulty in getting the money that was justly due. He built many other mansions for the nobility, for which he must have received considerable sums. From 1702 to 1711 he was comptroller of the board of works. In 1714 he was knighted by George I., in the following year appointed comptroller of the royal works, and in 1716 architect of Greenwich Hospital. He died 26th March, 1726. Vanbrugh's plays are admirable in dramatic conception as well as in wit, but are coarse and indelicate. His architectural works have been praised by many qualified critics of recent years.

**VAN BUREN, MARTIN**, president of the United States, was born at Kinderhook, N.Y., on Dec. 5, 1782. He was elected a senator of his state in 1812, and in 1821 a U.S. senator. He was governor of New York state in 1828, secretary of state under President Jackson in 1829-31, and for a few months in 1831 minister to England. He was vice-president during Jackson's second term (1833-37), and was himself president during 1837-41. At the election of 1840 he was defeated by the Whig W. H. Harrison, and he was again beaten when he ran in 1848 as a free-soil democrat. He died at Kinderhook on July 24, 1862. See works by Shepard (1888) and Bancroft (1889).

**VANCOUVER.** See **SPUR**.

**VANCOUVER ISLAND**, an island on the west coast of British America, in the Pacific Ocean, opposite and at no great distance from the west shore of British Columbia, of which province of Canada it forms part; length, 285 miles; breadth, from 40 miles to 80 miles; area, about 20,000 square miles. It has no navigable rivers, but several deep arms of the sea project far inland, forming good harbours. A mountain chain traverses the island from south-east to north-west at an average height of between 2000 and 3000 feet, the highest point being Victoria Peak (7484 feet) in the northern half of the island. The interior is rocky, often bare, but interspersed with moderately fertile valleys, with lakes and small streams, on each side of the mountain range. Coal is worked (at Nanaimo), and gold, copper, and iron-ore and other valuable minerals are found. Forests are numerous, and the timber trade is important. The fruits, cereals, and roots are similar to those produced in England, and come to great perfection. Horses, cattle, sheep, and pigs thrive well. The puma, the bear, the wolf, two kinds of deer, the marten, and other fur-bearing animals, exist in the less settled parts of the island; partridges, snipes, and many varieties of wild-fowl are found. The seas and lakes abound with fish.

The climate closely resembles that of England. The harbour of Esquimalt, on the south-east coast of the island, is one of the finest in the continent, and is the chief Pacific station of the British fleet. Victoria is the chief town, and the capital of British Columbia. A railway now connects Victoria with Esquimalt and the great coal-shipping port of Nanaimo. Pop. (1901), 50,154.

**VANDALS**, a German nation or confederation, probably allied to the Goths, who occupied at an early period the country on the south of the Baltic, between the Oder and the Vistula. At a later period they appear to have descended into Silesia, and occupied the country about the Riesengebirge. In the Marcomannian war they attacked Pannonia in conjunction with the Marcomanni and the Quadi. In the reign of Constantine they had migrated or spread themselves into Moravia, from whence they were transplanted to Pannonia, from which they migrated again, taking an eastward direction, into Dacia. In 406 they joined a confederate German host which crossed the Rhine into Gaul, and from thence, after Gaul had been ravaged, the Vandals found their way into Spain, in which they established themselves under their chief Godigiselus. In Galicia they contended with success with another barbaric horde of invaders belonging to the Suevi, and having vanquished a confederate army of Goths and Romans, they advanced still farther, and seized and ravaged Seville and Carthage. Under Genseric, who had newly assumed the leadership, they crossed to Africa. In 429 they vanquished the Roman governor and established a kingdom, which spread over the greater part of the Roman possessions on that continent. Genseric immediately began to revive the maritime glories of Carthage, diligently cultivating the means of maritime warfare, and extending his conquests to Sicily, Sardinia, and Corsica. He also invaded Italy, and sacked Rome in 455. The atrocities of the Vandals on this occasion have been a favourite subject of declamation, but Gibbon shows them to have been much exaggerated. Genseric concluded a long reign in peace in 477. The kingdom of the Vandals was continued under his descendants—Huneric, his son, who immediately succeeded him; Gundamund, 484; Thrasimund, 496; Hilderic, 523; Gelimer, 530. It was overthrown in 534 by Belisarius, the general of the eastern Emperor Justinian. The Vandals adopted the Arian faith, and persecuted the orthodox Christians.

**VAN DE VELDE, ADRIAN and WILLIAM.** See **VELDE**.

**VAN DIEMEN'S LAND.** See **TASMANIA**.

**VANDYCK, SIR ANTHONY**, except perhaps Titian the greatest of all portrait-painters, was born at Antwerp on the 22nd of March, 1599. His father was a silk mercer, and his mother was skilled in embroidering landscapes and figures. At the age of ten he became a pupil of Hendrik Van Balen, a friend of the great Rubens, and some six years later he opened a studio of his own at Antwerp. He was never a formal pupil of Rubens, but his style was formed under the influence of that master, with whom he was closely associated in the execution of some of his works. In 1619 he obtained the freedom of the Guild of St. Luke in his native city, and in 1620 he went to England on the invitation of the Earl or the Countess of Arundel. James I. granted him a pension, and the painter executed, though probably not from the life, the full-length portrait of the king now in Windsor Castle. Returning to Antwerp, he made, by the advice of Rubens, a journey to Italy. He set out in 1621 and went by way of Brussels to Genoa, where he made a prolonged stay with a group of Flemish

artists. A romantic story which was formerly told of his stay at Saventhem, near Brussels, is more than doubtful. On leaving Genoa he visited Rome, Florence, Bologna, Venice, Mantua, Palermo, and Turin, improving his knowledge of the Italian masters, especially of Titian and Paolo Veronese. The details of his return journey are obscure, but he was probably back in Antwerp in 1626. His fame was now at its highest, and efforts were made to induce him to settle in England. These succeeded, and in 1632 Vanduyck came to London. Charles received the painter with great distinction, bestowed upon him the honour of knighthood, a considerable annuity, and a summer and winter residence. Vanduyck rewarded this generosity by unceasing diligence: he enriched England with his master-pieces, and executed, besides a multitude of portraits, several mythological and historical paintings. He was fond of splendour, and lived in such an expensive style as to squander the greater part of the large sums he received for his portraits. When he found that the gains of his art did not suffice to meet his expenditure, he sought to increase his means by the pursuit of the philosopher's stone, but this of course only served to impair his resources still more, and gradually degraded his character by developing in him a thirst for gold. At the same time he ruined his health, and even weakened his intellect, by his licentiousness. To save him from the complete degradation into which he seemed likely to fall, some of his well-wishers, the king among the number, contrived to have him united in marriage to the beautiful Mary Ruthven, a grand-daughter of the Earl of Gowrie. Vanduyck visited his native city with her, and went thence to Paris, where he hoped to be employed to paint the gallery of the Louvre; but as the work had been already committed to Poussin, he soon returned to England. Though infirm and exhausted, he proposed to the king to paint the walls of the banqueting house with the history and procession of the order of the Garter, promising to make the cartoons. But he died soon after, in the forty-third year of his age, Dec. 9, 1641, the year after his master Rubens. In spite of his extravagant habits he died worth about £20,000. He was buried in St. Paul's. The principal galleries contain some of his pictures. Though Vanduyck shone in historical composition, his strength lay in portrait; and no painter ever exceeded him in the knowledge of *chiaroscuro*. In his portraits he gave a peculiar grace to his heads, and his expression was inimitable. His draperies are in a grand style, broad and simple in the folds, easy in the disposition, and the colouring lovely. In some particulars Vanduyck has been acknowledged to be superior to Rubens: his touch is more delicate, his ideas are more graceful, and his expression is more true. He sometimes amused himself with engraving, and etched several plates, consisting mostly of portraits, in a spirited style.

**VAN EYCK.** See **EYCK**.

**VANILLA**, a genus of climbing orchids, highly esteemed on account of the balsamic aromatic juice obtained from the pods of one or two of the species, and used as a flavouring ingredient for chocolate and other sweet preparations. The species which yields most of the vanilla of commerce is the *V. planifolia*, a native of the warm regions of Eastern Mexico, where it flourishes in moist shady woods, growing high up the trees and sending down aerial roots several feet in length. The plant has long lanceolate leaves very slightly ribbed, and large axillary flowers growing in racemes. It is cultivated in various parts of Mexico, as well as in the Mauritius and the East and West Indies.

**VANNES**, a seaport town in France, capital of the department of Morbihan, on the Vannes, where it falls into a narrow inlet of the Gulf of Morbihan, 64 miles north-west of Nantes. It is walled, and has narrow gloomy streets overhung by antiquated-looking houses. The principal public building is the cathedral. The town possesses a museum, very rich in Celtic antiquities. The manufactures consist of coarse cotton goods, lace, leather, and ropes. The trade is in corn, hemp, honey, wax, butter, salt, tallow, cider, and wine. Pop. (1896), 22,189.

**VANUCCI**, or **VANUCCI**, the family name of Pietro Perugino. See **PERUGINO**.

**VAPOUR.** See **GAS**.

**VAPOUR-BATH.** See **BATH**.

**VAR**, a maritime department of France, in the extreme south-east, bounded on the north by the department of Basses-Alpes, on the east by that of Alpes Maritimes, on the south by the Mediterranean, and on the west by the department of Bouches-du-Rhône; area, 2349 square miles. The coast is generally bold, and is penetrated by numerous indentations. Off the coast are the Hyères islands. The interior is generally mountainous. The principal rivers are the Verdon, on the north frontier, belonging to the Rhone system, and the Argens. About one-fourth of the whole surface is absolutely waste, and not one-sixth arable. There are magnificent forests of pine and oak—the latter affording much bark. The vine, olive, mulberry, and tobacco are all cultivated. The minerals include salt, lead, iron, coal, marble, &c. The manufactures include perfumes, liqueurs, olive-oil, soap, corks, leather, paper, and silk; and the fishing both of tunny and anchovies is actively carried on. The arrondissements are Draguignan, Brignoles, and Toulon. Draguignan is the capital, Toulon the chief town. Pop. (1896), 308,374; (1901), 325,490.

**VARANGIANS**, or **VARAGIANS**, the name (supposed to mean 'confederates') applied to the Norman vikings, who in the ninth century harassed the coasts of the Baltic, and in the close of the same century founded various principalities in Russia, one of which formed the nucleus of the whole Russian dominion. Some of them afterwards entered the service of the Byzantine emperors, and performed the duty of imperial guards at Constantinople. Here they were recruited, according to the Byzantine writers, by bands of their countrymen from Thule—that is, by Saxons and Danes, who fled from England to escape the Norman yoke. They continued to speak the Saxon or Danish language till the overthrow of the empire. The peculiar weapon of these Varangian guards, to whom the keys of the palace and the capital were intrusted, was the two-edged battle-axe. Sir Walter Scott's Count Robert of Paris is represented as belonging to this body-guard.

**VARANUS.** See **MONITOR**.

**VARIABLE QUANTITIES**, algebraic symbols placed in relationship one to another, so that if different numerical values are given to a particular letter the other letters will have corresponding values or sets of values; for instance, let  $y = x^2 + 3$ , when  $y = 12$   $x = 3$ , when  $y = 19$   $x = 4$ , and so on.  $y$  is called the independent variable and  $x$  the dependent variable, because the value of  $x$  depends on the value we assume for  $y$ .

**VARIATION OF CURVATURE**, the change in the curvature of a line in passing along it in any direction. The curvature at any point of a curve is measured by the reciprocal of the radius of curvature of the point.

**VARIATIONS**, CALCULUS OF, a branch of higher mathematics treating specially of the maxima and minima of functions of variables.

**VARICOSE VEINS** (Latin, *varix*, a dilated vein), veins in a diseased state in which they become dilated, and assume a tortuous course, presenting to the touch a soft elastic sensation, except in the situation of their valves, where they form hard knotty swellings, generally of a dark bluish colour. This disease occurs most frequently in the lower limbs, and is indeed a very common affection there; but it also occurs in the veins of the scrotum, and in those at the lower part of the rectum, forming in the latter case the tumours called bleeding piles. In the lower limbs *varix* is often complicated with peculiar indolent ulcers, and sometimes the *varix* bursts and hæmorrhage takes place, which if not speedily stopped may lead to death. Varicose veins are caused by the presence of some obstruction to the free return of the venous blood towards the heart, and such obstruction may arise from tumours within the abdomen, enlargement of the liver causing pressure on the ascending vena cava, pregnancy, constipation of the bowels, tight gartering, and other causes. As to the treatment, the first step of course is to remove the cause of the disease, whenever that is possible. If the disease is grappled with at an early stage much good may be effected by enjoining complete rest in a horizontal posture, by bathing the limb with cold water twice or thrice a day, and by the use of a properly applied bandage or laced stocking. When the disease is far advanced no radical cure can be effected except by a surgical operation, and the patient will generally do better to rest content with a palliative treatment.

**VARIETY.** See **SPECIES.**

**VARINAS**, or **BARINAS**, a town in Venezuela, in the state of Zamora, on the right bank of the St. Domingo, 80 miles south-east of Merida. It is a neat place, at the opening of a valley; and has a church and a hospital. Cacao, coffee, and tobacco are cultivated in the neighbourhood, but the town and its industries have much declined in recent years. Pop. about 2000, formerly 12,000.

**VARNA**, a seaport town of Bulgaria, on the west shore of the Black Sea, at the mouth of a river of the same name, 160 miles N.W. of Constantinople. It exports wheat, maize, cattle, attar of roses, &c., and imports woollens, metals, sugar, coffee, leather, haberdashery, machinery, &c. The harbour is being improved. It is the see of a Greek and a Bulgarian archbishop. In 1444 Ladislaus, king of Hungary, was defeated and slain by Amurath II., sultan of the Turks, near this town. In 1828 it was taken possession of by the Russians, but was restored to the Turks in the following year by the Peace of Adrianople. In 1854 the Crimean expedition sailed from it. Pop. in 1900, 33,443.

**VARNISH**, a solution of resinous matter, forming a clear, limpid fluid, capable of hardening without losing its transparency, and used by painters, gilders, cabinet-makers, &c., for coating over the surface of their work in order to give it a shining, transparent, and hard surface, capable of resisting in a greater or less degree the influences of air and moisture. The resinous substances most commonly employed for varnishes are mastic, sandarac, lac, benzoin, copal, amber, and asphalt; and the solvents are fixed oil, volatile oil, and alcohol. Before a resin is dissolved in a fixed oil it is necessary to render the oil drying. For this purpose the oil is boiled with metallic oxides, in which operation the mucilage of the oil combines with the metal, while the oil itself unites with the oxygen of the oxide. To accelerate the drying of this varnish it is necessary to add oil of turpentine. Fixed oil varnishes are the most durable, and are the best adapted for all objects that are exposed to the weather. Amber varnish is a varnish of this

kind. It is composed of amber, linseed-oil, litharge, and turpentine. Volatile oil varnishes consist of a solution of resin in oil of turpentine. The varnish being applied the oil flies off and leaves the resin. They are used chiefly for paintings. When resins are dissolved in alcohol the varnish dries very speedily, and is liable to crack; but this fault is corrected by adding a small quantity of turpentine to the mixture, which renders it brighter as well as less brittle. The coloured resins or gums, such as gamboge, dragon's blood, &c., are used to colour varnishes. Lustre is given to varnish after it is laid on by rubbing with pounded pumice-stone and water, wiping with a cloth, rubbing with an oiled rag and tripoli, and then cleaning with soft linen cloths, and brightening with the palm of the hand.

**VARRO**, **MARCUS TERENCE**, one of the most learned men and prolific writers of ancient Rome, born B.C. 116, served in his youth in the army, and at a later period obtained the dignity of tribune, with other public offices. Varro was the intimate friend of Cicero, and was proscribed by Antony, but managed to make his escape, and returned to Rome under Augustus, and died there in B.C. 28. The number of his writings, chiefly on language, history, and philosophy, is stated to have amounted to nearly 500, of which only one has come down to us entire—a treatise upon agriculture (*De Re Rustica*), in three books, which is contained in the collection *Scriptores Rei Rusticæ*, and a translation of which into English by Owen was published in 1800. Considerable fragments (six out of twenty-four books, v.-x.) of a treatise on the Latin language (*De Lingua Latina*) have also been preserved. The best editions are those of Spengel (Berlin, 1826) and Müller (Leipzig, 1833). A few fragments of his great work on antiquities (*Antiquitates Rerum Humanarum* and *Antiquitates Rerum Divinarum*) and of his *Saturne* are also extant.

**VARUS**, **PUBLIUS QUINTILIUS**, a Roman general, celebrated in consequence of the defeat that he suffered at the hands of Arminius (Hermann), leader of the Germans. He was consul in 13 B.C., afterwards governor of Syria, and about 7 A.D. received from Augustus the command to introduce the Roman jurisdiction into that part of Germany extending as far as the Visurgis (Weser) that had just been conquered by Drusus. A general revolt having been secretly arranged by Arminius, Varus was suddenly attacked by an immense host, and while trying to make his escape had his whole army destroyed in a pass of the Saltus Teutoburgiensis. Varus put an end to his own life. The exact scene of this battle is disputed. (See **ARMINIUS**.) In consequence of this defeat the Roman dominion was once more restricted on the side of Germany to the Rhine.

**VASA**, **GUSTAVUS**. See **GUSTAVUS I.**

**VASARHELLY**, or **HOLDMEZŐ-VASARHELLY**, a large market-town in Hungary, in the comitat of Csongrad, on Lake Hed and the Karoly Canal, leading into the Theiss, 12 miles north-east of Szegedin. Tobacco and wine are grown, and a great many cattle are reared in the neighbourhood, and large cattle markets are held in the town itself. The inhabitants mostly belong to the Reformed Church. Pop. (1890), 55,475; (1900), 60,883.

**VASARI**, **GIORGIO**, a painter and architect, but most distinguished as the biographer of artists, was born at Arezzo, in Tuscany, in 1511, and studied under Luca Signorelli, Michael Angelo Buonarrotti, and Andrea del Sarto. The Cardinal Ippolito de' Medici, Pope Clement VII., and the Dukes Alessandro and Cosmo of Florence, successively engaged him in their service. As an architect he showed

great ability, and two of his designs, that of the Palazzo degli Uffizi at Florence, and that of the church of Abbadia at Arezzo, are among the best of his time. As a painter he was less successful. His principal paintings are a Lord's Supper, in the cathedral of Arezzo, and several works in the Palazzo Vecchio in Florence, and in the Vatican in Rome. He has himself given us an account of his different works in Florence, Arezzo, Pisa, Venice, Bologna, Rome, &c. They exhibit all the faults of the late Florentine style. His work on the *Vite de' più eccellenti Pittori, Scultori ed Architetti*—Lives of Painters, Sculptors and Architects—is of great value. He, however, has fallen into many errors respecting the earlier masters, owing to the imperfection of existing accounts; and he is also guilty of partiality towards the Tuscan artists. The work was first printed in 1550, and an enlarged and otherwise improved edition appeared in 1568. The latter forms the basis of all subsequent editions, such as that of Milanesi (Florence, eight vols., 1878 onwards). An English translation by Mrs. Foster has been published in five volumes. He died at Florence in 1574.

VASCO DA GAMA. See GAMA.

VASELINE. See SUPP.

VASES, hollow vessels of various shapes and materials, generally with one or more handles, variously decorated and ornamented by means of pigments or otherwise, and used for many purposes. The scientific study of ancient vases—especially those of earthenware or terra cotta—as a branch of archaeology is of comparatively recent origin, but it has already shed much light on the life of antiquity. At first, attention was concentrated on the subjects of the decorative additions, but now the vases themselves are the object of careful investigation. Most of the ancient peoples have left numerous vases distinctive of their national character and civilization, but the most important by far are those of the Hellenic world, which have been found not only in Greece, but also in Asia Minor, Etruria, South Italy, Sicily, the Ægean and other Mediterranean islands, North Africa, and elsewhere. Hellenic vases may be grouped, according to period of production and artistic type, in four classes, namely: (1) archaic and early; (2) black-figured Athenian; (3) red-figured Athenian; (4) decadence. The earliest Greek vases yet discovered are probably those found by Schliemann at Hisarlik in the Troad (see TROY). They are of a very rude type, being hand made and unpainted, mostly without handles, though often having pierced projections for the purpose of suspension, and either undecorated or adorned only by means of incised lines and clay-strips. The island of Thera (now Santorin) has yielded great numbers of vases of a rather more advanced type. These vases, ascribed to the eighteenth or twentieth century B.C., are ornamented with figures of plants and animals in dull colours, and have been made wholly by means of the potter's wheel. The ware known as Mycenaean has been unearthed not only in the neighbourhood of Mycenæ, but also elsewhere on the mainland of Greece, on some of the Ægean islands, and in Rhodes and Crete. In the earlier specimens the colours are dull, but the later vases of this type are ornamented with more brilliant colours. The geometric style of ornamentation which begins to appear in the Mycenaean vases is found fully developed in the Dipylon vases found at Athens. The Phrygian vases show the rise of orientalism, which for a time exercised a great influence on the ornamentation. This influence is at its height in the Rhodian group, of which the

best-known specimen is the *pinax* or platter in the British Museum representing the combat of Menelaus and Hector over the body of Euphorbus. The Corinthian group of vases is also strongly Oriental in the style of the ornamentation. These have been found not only at Corinth and in other parts of Greece, but also in Etruria, notably at Caere. The Etruscan examples, however, were of Corinthian origin, at least in the main, though there is also a native Etruscan pottery of a different type. The most notable example of Corinthian ware is the Dodwell *pyxis* now in the Munich Pinakothek. The Corinthian are the earliest vases signed by their makers. About the fifth century Athens began to assume the lead in vase-making, and soon Corinth and other towns were driven from the Italian market. The earlier Athenian vases have usually a red, slightly glazed clay ground on which the figures are painted in glossy black enamel, touched up with red and white in certain parts. The designs are mainly mythological. The finest work of this black-figure period is the François vase found at Chiusi, now in the Florence Museum, which is signed by Ergotimus the potter and Clitias the painter. The most productive vase-maker of this time is Nicosthenes, from whom we have about seventy vases, mostly found in Etruria. A special type of black-figure vase is the Panathenaic amphora, which was presented as a prize at the Panathenaic games. After a period of transition black-figure vases were almost entirely displaced by red-figure ones, in which the art reached its zenith. The painters now broke with convention, and often substituted scenes from everyday life for the well-worn mythological incidents. Great simplicity, refinement, and purity of taste characterize the best vases of this period. Several styles of red-figure vase-painting have been distinguished, such as the severe style, represented by the productions of Sosias, Euphronios, Duris, and Brygos; a more graceful style, well represented by the Nola amphoræ in the Naples Museum; the Attic style of perfect elegance, of which the finest examples are the small *aryballi* found at Cumæ and at Ælone in Attica (now in Naples Museum); the white *lecythi* found in Attic tombs; and the beautifully gilded polychrome vases dating from the fourth century B.C., well represented by the *pelike* of Camirus in the British Museum and by a vase from Cumæ now in St. Petersburg. In vases of the decadence, ornamentation becomes overdone and tasteless, and ultimately, about 100 B.C., painted vases practically ceased to be made. Late vases have been found chiefly in South Italy and Sicily. Ancient vases were also made of metal, glass, alabaster, &c.; a famous glass vase being the Portland Vase (which see). There are also fine Chinese and Japanese vases. (See CERAMICS.)

VASSAL. See FEUDAL SYSTEM.

VATICAN, the most extensive palace of modern Rome, built upon the Vatican Hill, from which it has received its name, immediately to the north of the basilica of St. Peter's. It is a long rectangular edifice lying north and south, with an irregular cluster of buildings at either end. The present building was begun by Pope Eugenius III. (1145-53), and has been enlarged and embellished by many subsequent popes down to Pius IX. (1846-78). It now possesses twenty courts, and about 1000 rooms of one sort or another. Immense treasures are stored up in it. Here are the celebrated collections of pictures, and the museums, in which all the periods of the arts are represented by many of their most perfect productions. Here are the *loggie* or arcades of Raphael, Bramante, and Giov. da Udine,

and the *stanzas* or halls of Raphael; here are the Sistine and Pauline chapels (the former with Michael Angelo's celebrated ceiling paintings representing the preparation of the world for the advent of Christ, and the Last Judgment of the same painter on the altar wall); the *museo Chiaramonti*, with the Braccio Nuovo or new wing (founded by Pius VII., whose family name was Chiaramonti) and the *museo Pio-Clementino* formed under Popes Clement XIV. and Pius VI.; the *museo Gregoriano* (of Etruscan antiquities, formed under Gregory XVI.); the Egyptian museum, the tapestries of Raphael; here is the rich Vatican library (described below); here are pictures of almost all the first masters of that glorious period of which Raphael is the chief ornament; and near it is the gigantic St. Peter's. The Vatican has been used more or less as a place of residence by the popes since their return from Avignon in the latter part of the fourteenth century, and here the conclaves always meet for the election of new popes. The portion now occupied by the pope as a place of residence is the eastern wing of the court of Saint Damasus, in the south-east of the whole pile, the court surrounded by the loggie.

*Vatican Library.*—The collection of papal archives is known to have been begun as early as Pope Damasus I. (366-385) if not earlier, but Nicholas V. (1447-55) was the first to constitute a public library, for which Sixtus V. provided the great saloon (designed by Fontana), in which a large part of the library is still preserved. Leo X. devoted himself to the collection of Greek, Pius IV. of oriental manuscripts; Pius V. united the papal archives with the library; and various additions have been made since. In the suite of rooms allotted to the library are included the museum of Christian antiquities and the *stanza dei papiri*, the latter containing documents on papyrus from the fifth to the eighth century, and adorned with paintings by Raphael Mengs. The manuscript collection of the Vatican Library is by far the most important part of it. The number of MSS is said to be over 26,000. The number of printed volumes has been estimated at from 150,000 to 220,000, including 2500 fifteenth century editions, and a great number of bibliographical rarities. It is open for four hours per day on about two hundred days in the year.

VATICAN COUNCIL. See INFALLIBILITY.

VAUBAN, SEBASTIEN LE PRESTRE, SIEGNEUR DE, Marshal of France, and the greatest engineer which that country has produced, descended of an ancient and noble family of Nivernois, was born 1633, and early entered the army, where his uncommon talents and genius for fortification soon became known, and were signally displayed in various successive sieges. He rose to the highest military rank by his merit and services, and was made governor of the citadel of Lille in 1668, and commissioner-general of fortifications in 1677. He was made Marshal of France in 1703, and died at Paris in 1707, aged seventy-four. As an engineer he carried the art of fortifying, attacking, and defending towns to a degree of perfection unknown before his time. He fortified above 300 ancient citadels, erected thirty-three new ones, and had the principal management and direction of fifty-three sieges. Among the principal places fortified by him are the port of Dunkirk, and the citadels of Lille, Metz, and Strassburg. His works consist of a treatise entitled *La Dixme Royale* (1704), and a vast collection of manuscripts, in twelve volumes, which he calls *Mes Oisivetés*, containing his ideas, reflections, and projects for the advantage of France. Three volumes extracted from the *Oisivetés* were published at Paris in 1841-43.

VAUCLUSE, a department of France, bounded

north by Drôme; east by Basses-Alpes; south by the Durance, separating it from Bouches-du-Rhône; and west by the Rhône, separating it from Gard; area, 1370 square miles. The surface has a general inclination to the south and west, and all the eastern portion is rugged and mountainous. More than one-half of the whole surface is arable, and vineyards occupy about one-sixth of this portion. Some of the wines bear a good name, and are extensively exported to Switzerland and Germany. A good deal of ground is occupied by the mulberry (for the rearing of silkworms) and olive. Madder also is cultivated on a large scale, and considerable attention is paid to the rearing of aromatic and medicinal plants. Sulphur and coal are the most important minerals. The manufactures consist chiefly of silk stuffs, machinery, leather, beer and spirits, paper, cloth, &c. For administrative purposes Vaucluse is divided into the four arrondissements of Avignon, Apt, Carpentras, Orange. The capital is Avignon. Vaucluse takes its name (*Vallis clausa*) from the valley and village of that name rendered celebrated by Petrarch. Pop. in 1896, 235,033; in 1901, 235,457.

VAUD (German *Waudt*), a canton of Switzerland, bounded north by the canton and lake of Neuchâtel, west by France, south by the canton and lake of Geneva, and east by Fribourg, Bern, and Valais; area, 1244 sq. miles. The mountains of this canton belong to three distinct chains—the Alps, in which are the culminating points of the canton, in the south-east; the Jura in the west; and the Jorat, stretching to the north of the Lake of Geneva and forming a connecting link between the other two. Vaud belongs partly to the basin of the Rhine and partly to that of the Rhone, the Jorat forming the watershed which separates them. The principal river is the Broye. The climate is on the whole both temperate and salubrious. Salt, marble, coal, and building stone are worked, and there are mineral springs. The soil in general is not of remarkable fertility. Along the banks of the Lake of Geneva the culture of the vine is extensively carried on, and much wine of a fair quality is made. The manufactures comprise condensed milk, tobacco and cigars, clocks, musical boxes, chocolate, and iron-ware, and the trade is of some importance. Lausanne is the capital, and among other towns are Vevey, Yverdon, Payerne, and Avenches. The inhabitants are almost all Protestants, and education is very generally diffused. The greater part of Vaud belonged to Savoy, till in 1536 it was conquered by the Bernese, to whom it remained subject till 1798, when it freed itself with the aid of the French. It became a canton of the Swiss Confederation by the act of mediation in 1803. Pop. (1900), 279,152.

VAUQUELINITE, native chromate of lead and copper.

VAUXHALL GARDENS, formerly a fashionable place of entertainment and summer resort situated near the Thames, in the parish of Lambeth, about 1½ mile from Westminster Bridge. They were denominated from the manor of Vauxhall. They are now removed and built over.

VECTOR. See RADIUS VECTOR.

VEDĀNTA PHILOSOPHY, a system of Brahmanic philosophy, first set forth in a work called the Vedānta, said to have been written more than two thousand years ago, and described as containing the quintessence of the Vedas. This system is based, like that of the Eleatics among the Greeks, upon the unity of all real existence. The sole real existence is denominated knowledge (*jñāna*), soul, or God. The best idea that we can form of this one existence is that it is light or glory. But this idea is inadequate, and indeed misleading, for the one

real existence is none of the infinite number of modes of existence. The diversity of the universe, that is, the multiplicity of individual life and variety of external nature, is merely phenomenal, and has all proceeded from the one real being. It has done so by the exercise of a power or energy belonging to that being, which power is ignorance (*ajñāna*) or the negation of the very essence of that being. Ignorance has three qualities or 'fetters,' *sattva*, *rajas*, and *tamas*, which may be translated pure cognition, lively emotion, and inertness; or goodness, passion, and darkness; or purity, foulness, and darkness. In accordance with these qualities ignorance operates, and its operation is twofold, first, enveloping the soul and giving rise to the conceit of personality or conscious individuality; and secondly, throwing round it the phantasmagoria of external nature, which latter is composed of the five elements: vacuum, air, fire, water, and earth. The soul may escape from these illusions, and return to the knowledge that it is the one, either by a gradual process or by immediate emancipation. A gradual emancipation may be obtained by an ascetic way of living, and the constant practice of religious duties. Immediate emancipation can result only from the entire extinction of all consciousness of outward things, through meditation on the one supreme spirit, Brahma. See Monier-Williams's *Hinduism* (1877) for a brief *résumé* of the system; Colebrooke's *Essays* (1873); Gough's *The Philosophy of the Upanishads* (1882); Max Muller's *Three Lectures on Vedānta Philosophy* (1894); and the translation in *The Sacred Books of the East*.

VEDAS (from the Sanskrit root *vid*, meaning 'know'), the oldest of the *śāstras* or sacred writings of the Brāhmins, and the oldest compositions in the Sanskrit language. Their date is unknown. Sir W. Jones fixes it at 1500 B.C., and Ritter at 1400 to 1600 B.C. They are held by the Brāhmins in the highest respect, and it is believed that it involves guilt for a *śūdra*, or member of the lowest caste, even to hear a portion of them read. They are four in number, and are respectively called the Rīg, Yajur, Sāma, and Atharva Veda. Various mythological poems called *Itihāsa* and *Purāṇas* are looked upon as forming a supplement to the Vedas, and hence constitute a fifth Veda. All the Vedas are believed to be inspired, and although the author of each passage is mentioned in the explanatory table of contents to the Vedas called the *Anukramanikā*, such author or *Rishi* is regarded merely as the person to whom the revelation was made. In many cases, too, the *Anukramanika* ascribes the authorship of a passage directly to a divine being. The greater part, if not the whole of the Vedas is, in fact, the work of a class of devotees called *Munis*. The different portions of the Vedas are said to have long existed in a state of disorder, until they were arranged by Dwaipāyana, hence surnamed Vyāsa (the compiler) or Veda-Vyāsa. This Dwaipāyana is said to have taught each of the four Vedas to a different disciple, each of whom in turn instructed a number of other disciples, who again instructed others, until no fewer than 1100 schools of Vedic teachers arose.

The religious system of the Vedas is at bottom monotheistic. It derives a polytheistic appearance from the mention of the deity by various names according to the difference of his manifestations and attributes (*Sūrya*, *Mitra*, &c., the sun; *Soma*, the moon; *Agni*, fire; *Indra*, the firmament; *Vāyu*, wind, &c.), but the unity of the supreme being is expressly asserted in more than one passage, and the supreme being is declared to be alone worthy of worship.

Each of the Vedas is divided into three parts: the

first called the *Sanhitā*, which is made up of *mantras* or *gānas*, that is, prayers, hymns, &c.; the second, *Brāhmaṇa*, which relates chiefly to ritual; and the third the *Jñāna* or *Upanishads*, which is the philosophical portion of the work.

The first part of the designation Rīg-veda is derived from the word *rich* to praise. The name is due to the character of the mantras of this veda, which are for the most part hymns of praise or prayers consisting mainly of expressions of adoration. The subjects and uses of these mantras are endless. A choice is offered to a worshipper for every religious occasion that can be conceived. The *Brāhmaṇa* of the Rīg-veda consists chiefly of rules regarding the sacrifices to be performed by kings, the consecration of kings, &c. The thirty-eighth chapter describes a supposed consecration of Indra when elected by the gods as their king, and the ceremonies there described are similar to those enjoined for the consecration of earthly sovereigns, only more solemn in their character. The last chapter is about priests, and speaks of the benefit of entertaining them, of the selection of proper persons for the office, of the mode in which they are to be appointed by the king, and of the duties attached to the office. The *Upanishads* constitute the argumentative section of the Vedas. They are sometimes called collectively the *Vedānta*. They are not all separate compositions, but some of them form a portion of the *Brāhmaṇa* and one of them is even part of a *Sanhitā*. A portion of the *Upanishads* of the Rīg-veda, which closely resembles in its teaching the doctrines of the *Vedantists*, is held by that school in especial reverence. This portion treats of the creation of the universe, first of the regions above the visible heavens, then of the atmosphere, the earth, and waters, then of a god to rule these regions, by the self-existent and all-pervading soul (*Paramātmā*) or *Brahma*. It also explains how the universal soul penetrated the man.

The Yajur-veda is composed of two vedas, the White and the Black. It relates chiefly to oblations and sacrifices; and its name is derived from *yaj*, to worship. It contains instructions respecting the religious exercises suitable to all important events in life and to all kinds of religious duties. The Black Yajur-veda is more copious in mantras than the White, but less so than the Rīg-veda. No admittedly human authors are noticed by Colebrooke in this veda. A number of sections are ascribed to *Prajāpati* (lord of creatures), some to the moon, some to fire, and some to all the gods.

The Sāma-Veda is so called from *sāman*, a prayer arranged for singing. To this Veda the Hindus attach a peculiar degree of sanctity, so that even to read it is believed to free one from sin. There are four *Brāhmaṇas* of this Veda which are received by four different schools.

The dialect of the Atharva-veda is more modern than that of the others, and for this, among other reasons, several scholars regard it as of less authority, and even question whether it should be reckoned as a Veda at all. Some passages of the Indian scriptures themselves seem to support this doubt. The Atharva is not mentioned in an enumeration in the White Yajur, nor in a passage of the *śāstras* quoted by a commentator on the Rīg-veda, and the popular dictionary of Amara Singha names only three Vedas, while it makes mention of the Atharva without calling it a Veda. This Veda contains in the *Sanhitā* many forms of imprecation for the destruction of enemies, also a number of prayers for safety, and for the averting of calamity. Its most remarkable part, however, is its *Upanishads*, four of which, together with six belonging to the other Vedas, are



constantly cited in discussions on the Vedānta. See Whitney's *Oriental and Linguistic Studies*, Weber's *History of Indian Literature*, Monier-Williams's *Indian Wisdom*, Muir's *Sanskrit Texts*, Oldenburg's *Die Religion des Veda*, &c.

VEDETTE, a sentinel on horseback. It is also used sometimes for sentinels on foot, forming the extreme point in the line of outposts. They are often placed in pairs, in such a way that the field of vision of one intersects that of the other.

VEGA CARPIO, FELIX LOPE DE, a Spanish poet and dramatist, born at Madrid, November 25, 1562, of poor but noble parents; died at Madrid in August, 1635. After studying at Alcalá he became the secretary of the Duke of Alva. In 1582 he joined the army, and in 1588 accompanied the Invincible Armada. After being twice married and twice a widower he in 1609 became a priest, and afterwards was admitted into the third order of St. Francis (not earlier than 1611). The most brilliant part of his literary career was still to follow. He had already written and published various poems, but his productions were now multiplied with extraordinary rapidity. Scarcely a year passed in which he did not print a poem, and in general scarcely a month, or indeed scarcely a week passed in which he did not produce a piece for the theatre. He himself informs us that he had more than a hundred times composed a piece and brought it on the stage within twenty-four hours. Such pieces must, of course, have been very short. The fame that he enjoyed during his lifetime was immense. The people idolized him, and he received marks of distinction from the king of Spain and Pope Urban VIII. The latter, in return for the dedication of a tragedy on Mary Stuart, conferred on him the title of Doctor of Theology, and sent him the cross of the order of Malta. The profits that accrued from his works corresponded to his fame. His career thus contrasts strikingly with that of his contemporary Cervantes, who died (1616) in neglect and poverty in the very city in which Vega was then living in luxury and splendour, and whose fame has spread over the world, while that of Lope has greatly declined even in his own country. In his later years Vega became ascetic in his way of living. About 300 of his dramatic productions have been printed (Madrid, 1609-47). They reveal an inexhaustible but ill-regulated imagination, a strange mixture of the beautiful and the ridiculous, the sublime and the trivial, a rare mastery of dialogue, and extraordinary facility in versification. He has been described, probably with more epigrammatic force than strict accuracy, as the dramatist who has written the greatest number of good scenes, and the greatest number of bad pieces.

VEGETABLE CHEMISTRY, that part of plant physiology which treats of the chemical constituents of plants and the chemical changes accompanying their development. The essential facts may be briefly summarized here under a series of headings.

*Proportions of Water and Dry Matter.*—If a plant or a part of one be dried at a temperature somewhat above that of boiling water until no further loss of weight takes place, the total loss of weight represents the amount of water in the composition of the plant; and if the resulting dry material be burned in the open air, a small amount of grayish or yellowish ash will be left behind. The proportions of these three constituents, water, combustible dry matter, and incombustible inorganic ash, differ much in different plants and in different parts of the same plant. Thus, for red clover the percentages are (in the above order), 80·4, 18·3, 1·3; for the wheat

grain, 14·3, 76·5, 9·2; for a carrot (root), 85, 14·1, ·9; for an apple, 84·8, 14·8, ·4; for mangold leaves, 90·5, 7·7, 1·8. The water and the ash come from the soil, but the combustible portions come mainly from the atmosphere.

*Elementary Constituents of Plants.*—The elements which water and sand culture and the analysis of the ash have shown to be essential to the life of plants are: carbon, about 40-50 per cent of the dry matter, obtained partly from the soil but mainly from the carbon dioxide of the air; hydrogen, about 5-6 per cent of the dry matter, also in the water absorbed from the soil; oxygen, about 35-45 per cent of the dry matter, obtained from the air and the soil; nitrogen, especially in leguminous plants, obtained from the air and from the soil; phosphorus, especially in the ash of seeds, absorbed from the soil; sulphur, in small quantity, absorbed as sulphates from the soil; potassium, absorbed from the soil as various salts; calcium, absorbed as salts from the soil; magnesium, chiefly in the ash of seeds, absorbed as salts from the soil; and iron, present in very small quantity but essential to the formation of chlorophyll. In addition to the above elements the following are always present in green plants, though not essential to life: silicon, whose oxide forms fully a half of the ash of cereals, absorbed as silicates from the soil; sodium and chlorine, especially abundant as common salt in the halophytic plants, such as glasswort, beet, and other Chenopodiaceæ. Other elements that occur in some plants are zinc, copper, aluminium, manganese, cesium, rubidium, barium, strontium, silver, mercury, lead, cobalt, nickel, tin, thallium, selenium, titanium, boron, arsenic, fluorine, bromine, and iodine, the two last especially in sea-weeds.

*Principal Compounds in Plants.*—These may be grouped as follows, the first seven groups containing no nitrogen, whilst the remainder are nitrogenous.

(a) *Carbohydrates*, compound of carbon, hydrogen, and oxygen, the last two elements being present in the proportions found in water ( $H_2O$ ). The number of atoms of carbon in the molecule is six or a multiple of six. They include: (1) sugars, especially glucose, dextrose, or grape-sugar ( $C_6H_{12}O_6$ ), and fructose, lævulose, or fruit-sugar ( $C_6H_{12}O_6$ ) in fruits, saccharose or cane-sugar ( $C_{12}H_{22}O_{11}$ ) in the cell-sap, especially of the sugar-yielding plants, and maltose ( $C_{12}H_{22}O_{11}$ ) in germinated cereals, especially malted barley; (2) starch ( $n C_6H_{10}O_5$ ), obtained chiefly from potato tubers and the grains of cereals; (3) celluloses ( $n C_6H_{10}O_5$ ), the materials of the cell-walls, occurring in combinations or mixtures known as pectocelluloses, mucocelluloses, adipocelluloses, cutocelluloses, and lignocelluloses; (4) inulin ( $n C_6H_{10}O_5$ ), which replaces starch in the cell-sap of many Compositæ and Campanulaceæ, and occurs in the bulbs and other parts of many Liliaceæ and Amaryllidaceæ; and (5) the gums, non-crystalline carbohydrates, including gum-arabic, tragacanth, agar agar, dextrin, &c.

(b) *Vegetable Acids*, chiefly oxalic ( $C_2H_2O_4$ ), tartaric ( $C_4H_6O_6$ ), citric ( $C_6H_8O_7$ ), and malic ( $C_4H_6O_5$ ), the last three mostly in fruits.

(c) *Fixed Oils and Fats*, arranged, in so far as of vegetable origin, in seven groups, typified by olive-oil, rape-oil, cotton-seed oil, linseed-oil, castor-oil, palm-oil, and cocoa-nut oil.

(d) *Essential or Volatile Oils* may be hydrocarbons, ethers, aldehydes, phenols, &c., and give the characteristic odour to many plants. Among plants yielding them are camphor, chamomile, mustard, *Rosa damascena*, several pines, rue, rosemary, eucalyptus, juniper, cloves, thyme, spearmint, sage, almonds, anise, lavender, and cinnamon.



(e) *Glucosides* (amygdalin and indican contain nitrogen), which are transformed by acids and enzymes into sugars and other substances. Among them are salicin, in the willows; æsculin, in the horse-chestnut; and sinigrin, in many Cruciferae.

(f) *Resins*, which may be classified as: (1) resins proper, including colophony, frankincense, copal, dammara, guaiacum, lac, and sandarach; (2) oleo-resins, containing also volatile oil, among them being copaiba, elemi, anise, tacamahac, and turpentine; (3) balsams, containing cinnamic or benzoic acid, including storax, benzoin, Peru balsam, and Tolu balsam; and (4) gum resins, composed of gum and resin, including asafetida, olibanum, scammony, galbanum, gamboge, bdellium, myrrh, euphorbium, ammoniacum, opoponax, and sagapenum.

(g) *Tannins or Tannic Acids*, astringent substances, of which the best known are the digallic (gallotannic) and quercitannic acids obtained from various species of oak.

(h) *Proteids or Albuminoids*, complex compounds containing carbon, hydrogen, oxygen, nitrogen, and sulphur, more or less like white of egg in appearance and properties. They constitute a large portion of protoplasm, and also occur dissolved in the cell-sap, and some of them are stored as aleuron-grains in the cells of seeds and other organs.

(k) *Amides*, which occur in the cell-sap, chiefly represented by asparagine ( $C_4H_8N_2O_3$ ), betaine ( $C_5H_{11}NO_3$ ), and tyrosine ( $C_9H_{11}NO_3$ ).

(l) *Alkaloids or Vegeto-Alkaloids*, basic compounds generally containing carbon, hydrogen, oxygen, and nitrogen (a few have no oxygen), and usually occurring in plants as salts of organic acids. They are found in most of the dicotyledonous orders, though not in Labiatae and rarely in Compositae, and among monocotyledons they occur in a section of Liliaceae. They are mostly solid and often crystalline bodies, but some (e.g. coniine and nicotine) are liquids. Most are insoluble in water, but may be dissolved by alcohol, chloroform, ether, or benzene. Many of them are deadly poisons. The best-known vegeto-alkaloids are: atropine (deadly nightshade), quinine (cinchona bark), strychnine (*Strychnos nux-vomica*), theobromine (cacao), caffeine or theine (tea and coffee), morphine (opium poppy), nicotine (tobacco), coniine (hemlock), cocaine (coca), physostigmine (Calabar bean), pilocarpine (jaborandi), piperine (pepper), and veratrine (sabadilla).

(m) *Enzymes or Unorganized Ferments*, which transform reserve materials in seeds, roots, tubers, &c., into soluble substances capable of osmotic diffusion. These include: diastase, which changes starch into maltose and dextrin; cytsase, which dissolves the celluloses of the cell-wall; inulase, which converts inulin into levulose; invertase, which changes cane-sugar into invert-sugar, a mixture of dextrose and levulose; emulsin, which produces glucose and benzoic aldehyde from amygdalin; myrosin, which converts sinigrin into mustard-oil; lipase, which changes fats and oils into fatty acids and glycerine; and vegetable trypsin, which transform insoluble, indiffusible proteids into peptones and amides.

*The Fixation of Carbon.*—Green plants obtain some carbon from decaying remains of plants and animals in the soil, but the greater part of the carbon required by them is derived from the free carbon dioxide of the air. Saprophytes and parasites obtain their carbon from other organisms, dead or living, in which it has been assimilated from the atmosphere. The carbon dioxide of the air enters plants only at green surfaces, the surfaces where there are cells containing the green chloroplastids, and it is absorbed almost entirely at the openings called stomata. In the leaf or other cells the carbon dioxide

and water are so acted upon as to produce soluble carbohydrates and set free oxygen. This process, which takes place only in presence of chlorophyll and light and at suitable temperatures, is variously called carbon-fixation, photosynthesis, and assimilation. In respect of its final products this process may be represented by such an equation as  $12 CO_2 + H_2O = C_{12}H_{22}O_{11} + 12 O_2$ ; but the exact nature of the process is still unknown. Starch is the first visible product, and it has been supposed that sugars with the formula  $C_6H_{12}O_6$  are derived by condensation of formaldehyde ( $CH_2O$ ), produced according to the equation:  $CO_2 + H_2O = CH_2O + O_2$ . The chemical composition of chlorophyll, the green colouring matter, is unknown, but iron is essential to its formation.

*Assimilation of Nitrogen, &c.*—The only plants that seem able to assimilate directly the free nitrogen in the air are the Leguminosae, and even these are like all other plants in obtaining their requisite nitrogen most readily from nitrates in the soil. Ammonium salts and various organic compounds containing nitrogen can also supply plants with this element, but probably in most cases they are first changed by bacteria into nitrates of calcium, magnesium, potassium, and sodium. The proteids are ultimately formed with the aid of the nitrates absorbed, but the process is exceedingly obscure and probably very complex. Various amides, such as asparagine, appear to be intermediate products, and these react in some way with carbohydrates produced as explained above to form the important proteid compounds. The sulphur essential to the formation of proteids comes from sulphates, chiefly calcium sulphate, obtained from the soil. It is supposed that the sulphate reacts with the oxalic acid in the plant, with the production of the calcium oxalate so common as crystals in plant cells. The resulting sulphuric acid may then be reduced so as to form free sulphur. Phosphorus may similarly be obtained from phosphates in the soil.

*Respiration.*—Photosynthesis and the other assimilative processes are anabolic, or consist in the formation of highly-organized compounds from their inorganic constituents or sources. Respiration, which in green parts of plants is masked in daylight by the absorption of carbon dioxide, is catabolic, that is, it is a destructive process consisting in the resolution by oxidation of the complex organic bodies (carbohydrates, &c.) into simple inorganic products such as carbon dioxide and water. The process is obscure in its details, but it takes place only in the presence of living protoplasm. It has been supposed that the protoplasm itself is oxidized, and the other organic compounds are used up in restoring it.

**VEGETABLE IVORY**, the name which is applied to the kernels of the nuts produced by the *Phytelephas macrocarpa*, a palm growing in Columbia, South America. It is very hard and compact, has the appearance of ivory, and may be turned in the lathe, being used for buttons, umbrella handles, &c. The stem of the palm is extremely short, but the leaves rise to the height of 30 or 40 feet. See the plate at **PALMS**.

**VEGETARIANISM**, the practice of abstaining entirely from all flesh food, or from all food obtained by the killing of animals. The abstinence from flesh food is the essential element in the connotation of the word vegetarianism, but vegetarians are usually also total abstiners from alcoholic liquors, and in regard to the use of such animal products as eggs, milk, butter, and cheese, and of cereals, as well as on the advisability of cooking food, different views are held amongst them. The average vegetarian admits into his diet the animal products

above mentioned, and there are semi-vegetarians who also eat fish. With many persons, besides, vegetarianism is but one aspect of a philosophy of life, whose central principle may be stated as conformity to natural law in all the relations of individual and social life. The arguments for and against a vegetarian diet cannot be set forth here at length, but the most important of them may be indicated. They fall into three main classes, namely, physiological and hygienic, ethical, economic. Vegetarians claim that man is closely akin to an exclusively frugivorous group, the apes, and widely different from carnivora, herbivora, and omnivora. They assert, what is universally admitted, that the actual state of mankind and the science of physiology both show that a complete fleshless diet is possible and readily procurable, and they argue that if such be the case any moral arguments that may be advanced against the eating of flesh ought to have decisive weight. Anti-vegetarians object, that with a purely vegetable diet an enormous amount must be consumed in order to obtain sufficient nutriment, and that the waste products are excessive in quantity; but it is to be noticed that whatever be the force of this argument against extreme vegetarians, it can hardly be maintained against those who admit eggs, milk, &c. Vegetarians maintain that flesh-eating is responsible for the propagation of some of the most serious diseases of our time, notably tuberculosis and cancer, and they contend that it hinders the development of the higher nature of man both by its physiological influence and by the necessity of systematic slaughter entailed by it. It has been objected, that if animals now regularly slaughtered were allowed to breed unchecked the country would be overrun by them, but the possible answers to this argument are obvious. It is also claimed by vegetarianism that it is in such products as nuts, seeds, roots, eggs, and milk, and not in the comparatively degenerate form of flesh, that nature provides the means of supporting life in its best and most nutritive form.

Vegetarianism is as old as the ancient religion of Hindustan, and was taught by Plato, Plutarch, and other writers of classical antiquity. One of the oldest pioneers of the movement in Britain was George Cheyne (1671-1743), a Scottish doctor, who supported it in an *Essay on Regimen*, published in 1740. Shelley's vindication of natural diet is well known. J. F. Newton's *Return to Nature, or Defence of Vegetable Regimen*, was published in 1811, and in 1847 the Vegetarian Society was founded at Manchester. Eduard Baltzer (1814-87), a German liberal clergyman, introduced the movement into Germany, and founded at Nordhausen in 1868 a *Verein von Freunden der Natürlichen Lebensweise*. His book on *Die Natürliche Lebensweise* reached a fourth edition in 1896. Other leading German pioneers of vegetarianism are Gustav von Struve (1805-70), author of *Die Pflanzenkost, die Grundlage einer neuen Weltanschauung* (1869), in which he associates vegetarianism with socialism; and Theodore Hahn, author of *Die Naturgemässe Diät* (1859) and *Der Vegetarianismus* (1869). Vegetarianism has obtained less hold in France than in Britain and Germany. Among the chief French works on it are the *Thalysie, ou la nouvelle Existence* (1821) of Jean Antoine Gleizes (1773-1843), and *Le Végétarisme rationnel scientifique* (1889) of Dr. E. Bonnejoy. The early leaders of vegetarianism in America were Amos Bronson Alcott (born 1799), father of the well-known authoress Louisa May Alcott; Sylvester Graham (1794-1851), author of *The Science of Human Life* (1839); and Charles Lane, author of A brief practical *Essay on Vege-*

table Diet (1847). The Vegetarian Federal Union was founded in 1889, and several societies throughout the world are affiliated to it. Vegetarian restaurants are now comparatively common. For further information see the periodicals devoted to vegetarianism and the following works: Anna Kingsford's *The Perfect Way in Diet* (1881); Howard Williams's *The Ethics of Diet* (1888), a sort of encyclopædia of the subject; John Smith's *Fruits and Farinacea the proper Food for Man* (abridged edn. by F. W. Newman); F. W. Newman's *Essays on Diet* (1883); H. S. Salt's *A Plea for Vegetarianism* (1886); Sir B. W. Richardson's *Foods for Man* (1891); A. F. Hille's *Essay on Vegetarianism* (1893); and Josiah Oldfield's *Tuberculosis: Flesh-eating a Cause of Consumption* (1893).

VEHME. See FEMGERICHTE.

VEII, an ancient Etrurian city, on the river Cremera, celebrated in the early history of Rome, with which it had several wars. The last war with Veii was carried on between 405 and 396 B.C., when the city was taken by Camillus. Veii was completely laid waste, and in modern times the very site of the ancient city has been a subject of much dispute. It is now generally supposed that the ruins found near the modern village of Isola Farnese, 12 miles N.N.W. of Rome, mark the site of the ancient city. Cæsar, and afterwards Augustus, established a Roman colony at Veii; but it had again sunk into decay in Hadrian's reign.

VEIN, in mining. See MINING.

VEINS. See BLOOD-VESSELS.

VEIT, PHILIPP, German painter of the religious-romantic school, was born in Berlin in 1793, and was grandson of Moses Mendelssohn and stepson of Friedrich Schlegel. He studied art in Dresden and then went to Rome, where he became a member of the circle of which Cornelius and Overbeck were the chief representatives (see those articles), producing there the *Seven Years of Plenty, the Triumph of Religion, &c.* From 1830-43 he was director of the Stadel Institute at Frankfort. From 1853 he lived at Mainz, and died there, December 18, 1877. Some of his large frescoes for churches procured him a great reputation.

VELAZQUEZ (or VELASQUEZ), DIEGO RODRIGUEZ DA SILVA Y, a celebrated Spanish painter, was born at Seville in June, 1599. His father was Juan Rodriguez da Silva, of a Portuguese family, and his mother a Spaniard named Gerónima Velazquez. He was well educated with a view to a profession, but his artistic genius asserted itself, and he was placed under the painter Francisco Herrera the Elder. Owing, it is said, to Herrera's severity he soon left him, and continued his art training under Francisco Pacheco, whose daughter Juana he married in 1618. For a few years he worked in Seville, producing several tavern pieces, as they are called, *The Water-Carrier* (now at Apsley House), and the two religious pictures, *The Adoration of the Magi* (1619), in the Prado Museum at Madrid, and *The Adoration of the Shepherds* (also called *The Nativity and the Manger*), now in the National Gallery of London. In 1622 he went to Madrid to seek wider opportunities, and through Don Juan Fonseca, almoner to the king, he was introduced to Olivarez, the king's minister. Nothing came of this visit at the time, and he accordingly returned to Seville; but in the following year he was summoned to the court by Olivarez, and he at once gained the favour of Philip IV. and an appointment as court painter. He is said to have painted a portrait of Charles I., then Prince of Wales, when he was in Spain in connection with the project of the Spanish marriage, and among other portraits of

this early period in Madrid are those still extant of Philip IV. in Hunting Costume, the Young King Philip V., and Don Carlos, younger brother of Philip IV. *Los Borrachos* or *The Topers* (c. 1628), now in the Prado Museum, is one of his finest works.

In 1628 Rubens visited Madrid, and on his advice Velazquez went to Italy in 1629. He stayed in Venice, Rome, and Naples, studying several of the great Italian masters, but his own style was little influenced. He remained in Italy for two years, and during that time he painted *Joseph's Coat* in the Escorial Gallery, *Vulcan's Forge* in the Prado, Madrid, and *Views of Villa Medici* (Prado). He made a second visit to Italy, chiefly to Rome, in 1648-51, to purchase works of art for his king, and during his stay in the Italian capital he painted the portrait of Innocent X. now in the Palazzo Doria. Among the chief productions of this second period, between his two visits to Italy, are some fine portraits, including Don Baltasar Carlos (equestrian, 1635), Don Baltasar Carlos (1642-43), Count of Benavente (1635), Conde Duque de Olivarez (equestrian, 1640), Philip IV. and Isabella of Bourbon (two equestrian, 1644), his great historical painting, *The Surrender of Breda* (also called *Las Lanzas*, 1647), *The Crucifixion* (1638), and *El Primo*, one of Philip IV.'s dwarfs, besides other pictures of the royal dwarfs and buffoons, all now in the Prado Museum. On his return from his second visit to Italy he was appointed by the king Aposentador Mayor, and in this capacity it was his duty to procure lodgings for the king along the routes of his journeys. The duties of the office absorbed much of his time, and ultimately they proved to be in part the cause of his death. In 1659 he had to arrange for the marriage by proxy of Louis XIV. to the Infanta Maria Teresa on the Island of Pheasants in the Bidassoa, and the strain of the work told so seriously on his health that he died not long after his return to Madrid, on Aug. 6, 1660. His wife followed him to the grave a few days afterwards.

The masterpieces of his latest period are *Las Meninas*, showing himself painting Philip IV. and Queen Marianne in presence of the Princess Margaret, maids of honour, a master of ceremonies, dwarfs, &c. (1656), and *Las Hilanderas* or the *Tapestry-Weavers* of Madrid. Among notable pictures by Velazquez not already mentioned are the following:—In the Prado Museum, Philip IV. and his Second Wife at their Fold-Stools, full-length portrait of Marianne of Austria, Virgin Enthroned, Mars, equestrian portraits of Philip III. and his Wife painted long after their death, Court Jester, Mercury and Argus, Martínez Montañés the sculptor, the Infanta Maria Teresa, and SS. Paul and Antony the Hermits; in the National Gallery, Philip IV. hunting the Wild Boar, The Dead Roland, a bust of Philip IV., a full length of the same, and Christ at the Column; in the Louvre, Meeting of Artists, and others; in Vienna, Family of Velazquez, Philip IV., and others; in Valencia Museum, his own portrait; in private British collections, Don Baltasar Carlos (several), St. Clara, Doña Juana Pacheco, Stag Hunt, Don Adrian Pulido Pareja (two), Juan de Pareja (two), Lot and his Daughters, The Finding of Moses, Philip IV. (several), Isabel of Bourbon, Olivarez, Deliverance of St. Peter, Venus and Cupid, and Supper at Emmaus; and others in Berlin, Dresden, St. Petersburg, America, &c. In Velazquez the realism that characterizes all great Spanish art reached its grandest expression. He owed something to other masters, especially Ribera, but it has been truly said that his real master was nature. His genius was so individual and unique that he had no followers and

founded no school, though other painters acquired something of his technique. Ruskin has said that whatever Velazquez has done may be accepted by the student as correct. See Stowe's *Velazquez* (1881); Curtis's *Velazquez and Murillo* (1883); Justi's *Velazquez and his Times* (Eng. trans., 1889); and Stevenson's *The Art of Velazquez* (1895).

VELDE, ADRIAN VAN DE, Dutch painter, younger son of the following, was born at Amsterdam in 1635 or 1636, and died in 1672. He is one of the best painters of landscapes. He is also known for having painted the figures and animals in the landscapes of other artists, for example, of his teacher, Jan Wynants, Van de Heyden, &c. He also painted some large historical pieces.

VELDE, WILLEM VAN DE, the Elder, one of a distinguished family of painters, was born at Leyden in 1610. He was originally bred to the sea, but afterwards studied painting, and retained enough of his former profession to make it the source of his future fame. He became early distinguished for his excellence in marine subjects, which induced him to go to England with his son, both of them entering into the service of Charles II. He is said to have repaid the favours of his royal patron more gratefully than patriotically, by conducting the English fleet to burn Terschelling. He is said to have been present at several sea-fights, merely in order to sketch the incidents. He chiefly painted in black and white, on a ground so prepared on canvas as to give it the appearance of paper. He died at London in 1693. His son, William Van de Velde the Younger, was born at Amsterdam in 1633, and painted the same class of subjects as his father, whom he surpassed. In fact, no period since the revival of art has produced his equal in his own peculiar line. He coloured many of his father's designs. His principal works are chiefly to be found in the royal collections and cabinets of England. He died April 6, 1707.

VELELLA (see Plate at PROTOZOA, figs. 3-5), a curious genus of Coelenterate animals, belonging to the class Hydrozoa, and represented by free-swimming oceanic forms, which occur around our coasts, but more frequently in warm seas. The *Velella vulgaris* is a familiar species. This organism—included in the order Physophoridae—is about 2 inches in length by 1½ inch in height. It consists of a broad 'float' or pneumatophore of rhomboidal shape, bearing a vertical sail-like crest on its upper surface. This structure also bears a single large polypite or digestive cavity, with reproductive bodies, and tentacles fringing the margin of the disc. No swimming-bells are developed. A system of ciliated canals traverses the clear jelly-like organism, which is tinted of a beautiful blue colour. A special family, *Velellidae*, has been constituted for the reception of this genus. The name 'Sallee Man' is sometimes given to the Velella.

VELEZ-MALAGA, a city of Spain, in Andalusia, in the province of Malaga, and 15 miles east of the city of that name, on the Velez, 1½ mile from the Mediterranean. It is a well-built and prosperous town, overlooked by a Moorish castle on a high rock. The district is exceedingly fertile, and produces the sugar-cane, indigo, batatas, palms, olives, oranges, and other fruits. Pop. 25,000.

VELINO. See TERNI.

VELLEIUS PATERCULUS. See PATERCULUS.

VELLETRI, a town in Italy, 21 miles south-east of Rome. It is surrounded by ruinous walls, and is irregularly built. The buildings chiefly deserving of notice are the cathedral, a handsome Gothic structure rebuilt in 1660; the town-hall, built from the designs of Bramante; the palace Lancelotti or Ginetti, with the finest marble staircase in

Italy and the palace Borgia. Velletri (anciently Velitrae) was the birth-place of the Emperor Augustus. Pop. (1881), 15,673.

**VELLORE**, a town and fort of India, presidency of Madras, district of North Arcot, 80 miles w.s.w. of city of Madras. The town has no edifice deserving of notice, except a large pagoda, with some remarkable sculptures. The fort is of considerable extent, but it is completely commanded by the adjoining hills. Within are a great 'pagoda, now used as an arsenal; the hospital, the barracks, magazine, and quarters for staff-officers. A revolt of the native troops took place here on the 10th of July, 1806. More than 100 Europeans were massacred. Pop. (1901), 43,537.

**VELLUM**, a writing material, resembling fine parchment. It is made of calf and kid skin, extended and drawn to a proper thinness when green. Parchment is made of sheep-skins in like manner. See **PARCHMENT**.

**VELOCIPEDE**, a light carriage consisting of a simple frame-work, supported on two or three wheels, and which is driven by the feet acting on cranks attached to the axle of one or two wheels. See article **CYCLING** in SUPP.

**VELOCITY**, the rate at which a body changes its position in space. Velocity is popularly expressed as so many miles per hour, or as so many feet per second. A man who walks at a rate of 5 miles per hour has a greater velocity than a man who walks at a rate of 4 miles per hour, and if the number expressing the time is constant, the velocity is proportional to the number expressing the distance. Again, a man walking at a rate of 5 miles in two hours has a less velocity than a man walking at a rate of 5 miles in one hour, and if the number expressing the distance is constant, the velocity is inversely proportional to the number expressing the time, therefore we can measure velocity numerically by dividing the number expressing the distance which would be traversed in a given time by the number expressing the time.

Algebraically,  $v = \frac{s}{t}$ , where  $v$  is velocity,  $s$  space or

distance, and  $t$  is time in units which are specified. Velocity is said to be *uniform* when equal spaces are described in succeeding equal small intervals of time; velocity is said to be *uniformly accelerated* when it increases by equal amounts in equal small intervals of time. Velocity as defined above is sometimes called *absolute velocity*; the *relative velocity* of a body is the rate at which it moves from or towards another moving body. *Angular velocity* is the velocity of the spoke of a wheel measured as a number of angles of a specified extent (as right angles or as radians) divided by a measure of time in specified units. See **FALL OF BODIES**, **FORCE**, **MOTION**, &c.

**VELOCITY OF ELECTRICITY**, the rate at which electricity is propagated through a conductor. The velocity of electricity through a conducting wire is in all cases very great when compared with the velocities of moving bodies, such as the velocity of a railway train or of a projectile; but the velocity of electricity, any more than the velocity of a planet, of a railway train, or of a bullet, is not a certain number of miles per second fixed for all cases; it varies for a number of causes, and to such an extent that while Wheatstone found the velocity through copper wire to be 283,000 miles per second, in the Atlantic cable of 1858 it was found to be 3000 miles per second. Faraday showed that a submarine cable acts precisely as a leyden-jar, that the water serves as the outside coating, and that just as a leyden-jar takes time to become charged and to discharge, so a cable through which a sharp signal is sent from one end delivers the signal at the other

end more or less prolonged; that is, the deflection of the receiving needle is gradual, reaching a maximum and then at the same rate coming back to rest. Sir William Thomson (Lord Kelvin) showed that the more delicate the receiving instrument, the more instantaneous is the first appearance of the current at the receiving end of the cable. He gives three reasons for the retardation of the electric current.

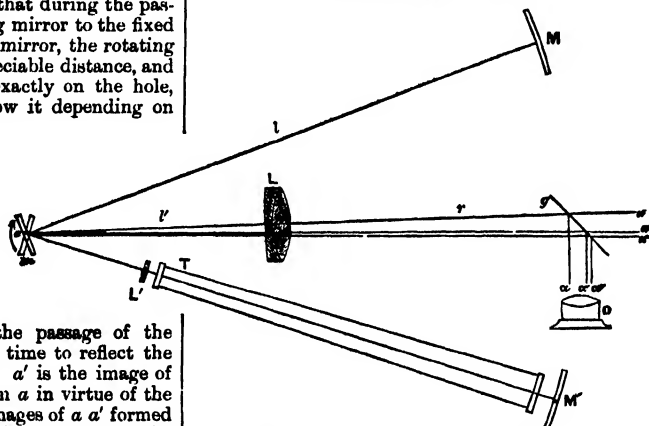
(1.) Charge and electrical accumulation in a conductor subjected in any way to the process of electrification. (2.) Electromagnetic induction, or electromotive force, excited in a conductor by variations of electric currents either in adjacent conductors or in different parts of its own length. (3.) Resistance to conduction through a solid. The first successful attempt to find the velocity of electricity was made by Wheatstone with the revolving mirror (his invention), which has been so successfully employed by Foucault to discover the velocity of light. Wheatstone had a sparkboard with six knobs upon it, which we will call 1, 2, 3, 4, 5, and 6; 1 was connected with the outside coating of a leyden-jar, between 2 and 3 was inserted  $\frac{1}{2}$  mile of copper wire, and between 4 and 5 there was another  $\frac{1}{2}$  mile of copper wire. When connection was made between 6 and the inside coating of the jar there was a spark between 1 and 2, a spark between 3 and 4, and a spark between 5 and 6. The revolving mirror was placed to reflect the three sparks, and when it revolved with a high velocity it was seen that the middle spark was displaced from being in a straight line with the other two; moreover, the sparks were elongated, and from measurements of the displacement and of the elongation Wheatstone estimated the velocity of electricity and the duration of the electric spark.

**VELOCITY OF LIGHT**, the rate at which light is propagated. There have been two astronomical estimates of the velocity of light and two terrestrial estimates. The satellites of Jupiter revolve regularly round the planet. When the Earth is in such a position with respect to Jupiter that there is the distance of the breadth of the Earth's orbit in addition to the distance of Jupiter's orbit from the Earth's orbit between Jupiter and the Earth (when Jupiter is in opposition), there is an irregularity of 16 min. 26.6 sec. in the times at which they are hidden by the planet as compared with corresponding occultations when the Earth is the breadth of her orbit nearer Jupiter (when the Earth is in conjunction). Thus it takes light 16 min. 26.6 sec. to pass across the Earth's orbit. Taking this distance as 183,000,000 miles the velocity thus found is 185,500 miles per second nearly. The second astronomical estimate has been made by means of what is called the aberration of the fixed stars. Each star appears to describe a small orbit in the course of a year about its true place. The motion of the earth in its orbit carries the spectator at one time so as to increase the relative velocity of the light from the star, and at another so as to diminish this velocity. In this way it has been computed that the velocity of light is about 10,000 times the velocity of the earth in its orbit, that is, about 185,000 miles per second. Roemer, a Danish astronomer, invented the first of these methods, and Bradley, an English astronomer, invented the second. The two experimental estimates were made, the first by Fizeau, and the second by Foucault. Imagine a toothed-wheel rotating so that a small aperture is covered and uncovered at the passage of a tooth and space. A ray of light sent through the open aperture and reflected back on its path from a long distance may, if the motion of the wheel is comparatively slow, return through the same space on the wheel; but if the motion of the wheel is much increased the wheel-

rim may have moved, so that the aperture is covered by a tooth when the ray has again arrived at the rim of the wheel. When the return ray cannot be seen by an observer placed at the outside of the aperture, the velocity of the wheel is such that a point on its rim moves the distance between the centre of a tooth and the centre of a space in the time taken by light to travel twice the distance of the wheel from the reflecting mirror. M. Fizeau placed his mirror about  $5\frac{1}{2}$  miles off. The method employed by Foucault is more reliable than that of Fizeau. This is an application of the revolving mirror first used by Wheatstone to determine the duration of the electric spark. Imagine a ray of light, and a reflecting surface placed in its path; the direction of the reflected ray will depend on the angle between the reflecting surface and the incident ray. It is easily proved, that as the angle between the incident ray and the surface is changed, the angle between the incident and reflected rays changes at twice the rate. A beam of light enters a darkened room by a square hole across which is a piece of platinum wire; this beam falls upon a rotating mirror which reflects the image of the hole in different directions as it rotates. In the path of one of these reflected beams is placed a concave mirror which sends the image back to the rotating mirror, and it is found that during the passage of the ray from the rotating mirror to the fixed mirror and back to the rotating mirror, the rotating mirror will have moved an appreciable distance, and the return beam will not fall exactly on the hole, but at a distance above or below it depending on the rate and direction of rotation of the mirror. The accompanying figure illustrates the positions of the pieces of apparatus in the experiment.  $a$  is the aperture,  $L$  is an achromatic lens,  $m$  is the revolving mirror;  $M$  is the fixed mirror,  $g$  is a plane reflecting surface of unsilvered glass so as to permit the passage of the beam from  $a$ , and at the same time to reflect the return beam to the eyepiece  $o$ .  $a'$  is the image of the platinum wire displaced from  $a$  in virtue of the rotation of the mirror,  $a'$  are images of  $a$  formed by the glass-plate  $g$ . The mirror  $m'$ , the tube  $T$ , and the lens  $L'$ , seen below, are for the purpose of demonstrating experimentally that light travels more slowly through dense mediums than through rarer mediums; the tube  $T$  being filled with water,  $a''$  and  $a'''$  are the images formed by the light which has traversed the water. M. Foucault, after perfecting his method, determined the velocity of light in air to be 298 million metres per second. Professor Michelson and Professor Newcomb, both of the United States, made careful measurements of the velocity by improved forms of Foucault's method in 1882. Their results were practically alike, namely 299.86 million metres per second, or about 186,300 miles per second.

**VELVET**, a rich kind of stuff, all silk, covered on the outside with a close, short, fine, soft shag, the other side being a very strong close tissue. The nap or shag, called also the *velveting* of this stuff, is formed of part of the threads of the warp, which the workman puts on a long, narrow-channelled ruler or needle, which he afterwards cuts by drawing a sharp steel tool along the channel of the needle to the ends of the warp. Florence and Genoa were long noted for the manufacture of velvet, but Lyons, in France, is its principal seat; Krefeld and Elberfeld are the chief seats of velvet-making in Germany. Cotton and woollen fabrics woven in this manner are called *velveteen* and *plush* respectively.

**VENDACE** (*Coregonus Willoughbi*), a genus of Fishes, included in the Salmon family, and in the same genus as the Pollan (*C. Pollan*) or Fresh-water Herring of Irish and other lakes. The Vendace occurs at Lochmaben in Dumfriesshire, and in Derwentwater Lake in Cumberland. It is also found in Bassenthwaite Lake, and in Ullswater. On the banks of the latter it is locally known by the name of 'Skelly'. Apparently this fish does not exist in the fresh waters of the eastern side of Britain. Pennant quotes the idea that the fish was introduced into this country by Mary Queen of Scots, but it was more probably introduced by the members of some of the religious houses. Its name is variously supposed to be derived from the French *vandoise* a dace, and from *La Vendée* in France, from which the fish was believed to have originally come. The Vendace inhabits lakes in the middle and north of Sweden. This fish resembles the herring closely in shape. Its average length is about 7 or 8 inches. The upper parts are delicate greenish-brown, the belly silvery. The habits of this fish appear to lead large numbers to congregate together in shoals. The males are much less numerous than the female fishes, and are also of smaller size. The breeding season is at the middle of



November. In the delicacy of its flesh the Vendace equals its better-known neighbours the Salmon and Trout. A fish of the same genus, the *Coregonus marina* of the Continent, is shown at ICHTHYOLOGY, Plate III., fig. 13. Some fine North American species are known as white fish.

**VENDEE**, a maritime department of France, formed from the ancient Poitou, and deriving its name from the river Vendée, is bounded on the north by the departments of the Loire-Inférieure and Maine-et-Loire; on the east by the department of Deux-Sèvres; on the south by that of Charente-Inférieure; and on the south-west and west by the Bay of Biscay; area, 2595 square miles. The surface is much diversified, and is divided into three distinct parts: the *Bocage* (Thicket), on the north and north-east, a hilly and wooded district forming about one-half of the department; the *Plaine*, a tongue of land included between the Bocage and the southern limit of the department, a bare arid tract sloping down towards the sea; and the *Marais*, including all the south and west coasts, where salt marshes prevail. In the north the department is watered by tributaries of the Loire, especially the Sèvre-Nantaise, and in the south by the Lay (with the Yon) and tributaries of the Sèvre-Niortaise. Besides grain, which more than suffices for the home consumption, the principal

crops are flax and hemp; a considerable quantity of an indifferent white wine is also produced. For administrative purposes Vendée is divided into three *arrondissements*—La Roche-sur-Yon, Fontenay-le-Comte, and Sables-d'Olonne, which are subdivided into thirty cantons and 299 communes; capital, La Roche-sur-Yon (Napoleon-Vendée). The inhabitants, particularly those of the Bocage, are remarkable for the simplicity of their manners, and their attachment to old usages, to the nobility of the district, and to the clergy. Inspired by such daring leaders as La Rochejaquelein, Cathelineau, Charette, and Soffiet, and aided by the hilly and wooded nature of the ground, they carried on from 1793 to 1796 a war in the royalist cause, which endangered the existence of the republic. The first severe check they met with was at Savenay, 24th December, 1793, where their forces were broken up, and the survivors and their families were dragged to Nantes and drowned in masses by Carrier. In the following year a fresh outbreak took place, and the Vendéans were joined by the Chouans, but after some fighting they were pacified by the government granting an amnesty, freedom from military service, the free exercise of their religion, and an indemnification for their losses. The landing of some thousands of émigrés at Quiberon encouraged them to resume their arms, but the rising was completely quelled by the activity of General Hoche, who treated the Vendéans, however, with great mildness. In the winter of 1799-1800, and again in 1814 and 1815, some risings took place in favour of the Bourbons, but they were quickly suppressed by prudent and vigorous measures. See CATHELINÉAU, CHOUANS, and LA ROCHEJAQUELEIN. Pop. in 1901, 439,637.

VENDEMIERE. See CALENDAR.

VENDÔME, a town of France, in the department of Loir-et-Cher, on the Loir, at the foot of a hill covered with vineyards, 20 miles N.W. of Blois. It is regularly and well built, and on a height above it rise the picturesque ruins of the old castle of Vendôme. It contains a fine old church, and has manufactures of gloves, tanneries, and cotton and paper mills. Pop. in 1896, 7091.

VENDÔME, LOUIS, DUKE OF, the celebrated general of Louis XIV., was the grandson of César, eldest son of Henry IV., and Gabrielle d'Estrées. He was born in 1654, early entered the military service, and received, in 1702, the command of the French army in the war of the Spanish Succession. After having distinguished himself in Italy, Tyrol, and Belgium, the Duke of Burgundy was placed over him; and the disagreement of the two commanders caused the defeat of the French at Oudenarde (July 11, 1708). Through the influence of Madame de Maintenon Vendôme was recalled; but when the affairs of Philip V. in Spain began to wear a threatening aspect, the Spaniards requested Louis XIV. to send them Vendôme. His arrival changed the state of things. December 9, 1710, he defeated the Austrian general Starhemberg at Villa-Viciosa, and having re-established Philip's throne he died in 1712, and was buried in the Escorial. His brother Philip was grand prior of the order of the Knights of Malta, in France. He was born in 1655, served in the Spanish war of Succession, and died in 1724.

VENEER, a thin layer of choice hard wood, such as mahogany, rosewood, maple, &c., glued to the surface of wood of a commoner sort, such as fir or pine, so as to give the whole the appearance of being made of the more valuable material. It is mostly used for furniture, and owing to recent improvements in sawing machinery, layers as thin as paper can be obtained.

VENESECTION. See PELEROMETRY.

VENETIAN SCHOOL. See PAINTING.

VENEZUELA, a republic in the north part of South America, bounded on the north by the Caribbean Sea, on the east by the Atlantic and British Guiana, on the south by Brazil, and on the west by Colombia; area, as now delimited, about 544,000 sq. miles. The Andes enter Venezuela from the west in two branches; the western branch incloses the Lake of Maracaybo on the west, and reaches the coast at Cape Chichibacoa; it has a moderate elevation, rarely exceeding 4000 feet. The eastern branch enters much farther south, and stretches north-east for about 300 miles, being about 60 miles in breadth; it is an immense pile of rocks, rising to the limits of alpine vegetation. The *paramos* or summit plains have generally an elevation of 12,000 feet, and the Sierra-Nevada-de-Merida, the two loftiest summits of which are respectively 15,342 and 15,310 feet high, is always covered with snow. Breaking off from these mountains near Trujillo, a branch runs north-east, and then parallel with the north coast, and at no great distance from it. Here the Silla de Carácas rises to a height of more than 8000 feet. The valleys and table-lands of these coast mountains are the chief seats of cultivation in Venezuela, and form the most populous region of the torrid zone in the New World. In the south, on the frontiers of Guiana, rises an insulated group known as the Mountains of Parima, between the Orinoco and the Amazon, an unexplored region, overgrown with superb forests. From these mountains to the coast chain at Carácas, and from the foot of the Andes to the mouths of the Orinoco, extend vast plains (*llanos*) with an area of 300,000 square miles, having the appearance of a bare sun-burned desert in the dry season, though in the rainy season vegetation comes forth and spreads itself abroad with surprising rapidity. The rivers are now quickly filled, and their waters spread over the low-lying llanos, forming great seas; the higher lying plains feed cattle and horses in great numbers. The principal rivers are the Orinoco and its affluents, the former traversing the centre of the country; the rivers flowing into the Caribbean Sea are much inferior in magnitude. The chief lakes are those of Maracaibo and Tacarigua; but the former is rather a gulf of the sea than a lake. The chief ports are La Guayra, Puerto Cabello, and Ciudad Bolívar; La Guayra owes its importance to its vicinity to Carácas, and to the populousness of the neighbouring country.—The climate exhibits in the fullest manner the equatorial character; the seasons are distinguished as they are wet or dry. On the coasts there are two rainy seasons, from December to January, and from April to November. In other parts of the country, as at the foot of the Andes, rains fall heavily with little intermission for ten or eleven months in the year. The whole of Venezuela, excepting the alluvial tracts about the Orinoco, is liable to earthquakes. From the level of the sea to the height of 3800 feet, extends the region of palms; mingled with the palms are cacti of candle-labra forms, sensitive mimosa, the pine-apple, the milk-tree, the mahogany, and the trees yielding *sarsaparilla*, *copaiba*, dragon's blood, and other drugs, besides caoutchouc from several trees of different kinds. Starting from an elevation of generally 2000 feet are the forests of the chinchona or Peruvian bark tree, the aromatic vanilla, the plantain, &c. Trees grow stunted at an elevation of 8000 feet, where all the grains of temperate regions attain perfection. At the height of 13,700 feet only lichens and hepaticæ cover the rocks. The natural wealth of the country consists at present chiefly in its vegetable products. Coffee is extensively grown in the more temperate districts, and cacao in the hot low-lying regions. Sugar-cane, cotton, maize, and other plants are also



cultivated. Among the minerals are gold, silver, tin, and copper, the latter being the only metal now produced to any extent; coal is said to be excellent and abundant in many of the coast districts; salt mines are found in the same districts; asphalt and petroleum abound round Lake Maracaybo.—The wild animals include the jaguar (now rare), puma, tapir, ounce, wild-cat, various tribes of monkeys and serpents, the alligator, the manatee, &c. The turtles of the Middle Orinoco yield a valuable oil, and caripe butter is obtained from the guacharo, a bird found along the coasts. The population is of Spanish, Indian, and Negro origin, either of pure or mixed blood. The white inhabitants of pure blood do not amount to more than a fourth, while more than half are mestizoes, mulattoes, and other mixed breeds. A considerable number of the Indians lead an independent life, free from all control of the state. The trade has greatly increased within the last few years. The total value of the exports in 1898 was £3,000,000; of the imports, £1,700,000. The trade is carried on chiefly with the United States, Britain, Germany, and France, the staple export being coffee. The chief exports to Britain are copper ore and regulus. The constitution is modelled on that of the United States of America, each state having its own legislature and executive, its own budget, &c. In 1901 a division into twenty states, a federal district, four territories, and two colonies was introduced. The legislature for the whole republic consists of a congress with two houses, a senate and a house of representatives. At the head of the executive is a president. The capital and largest town is Caracas. The revenue is about £1,500,000; the public debt amounts to about £8,000,000. The Republic of Venezuela was formed in 1830 by secession from the other members of the state of Colombia founded by Bolivar. (See COLOMBIA.) Since 1847 it has suffered greatly from civil war. A boundary dispute with Great Britain regarding the frontier towards British Guiana assumed a serious aspect in 1895–96, but was settled by arbitration in 1899. Since 1901 there have been internal troubles and a dispute with Colombia which led to some fighting. Pop. in 1894, 2,444,816.

**VENICE** (Italian *Venezia*, German *Venedig*), a city of Northern Italy, capital of a province in the compartment or division of Venetia, situated on about 120 islands in a lagoon or shallow bay of the Adriatic Sea (Gulf of Venice), north of the mouths of the Adige and Po, 150 miles east of Milan and 70 miles w.s.w. of Trieste. Though built on many islands the city has a compact, roughly elliptical form, since the greater number of the islands are situated close together and separated only by narrow canals (*rii*), about 175 in number, over which 378 bridges have been constructed. The city is about  $2\frac{1}{2}$  miles from the mainland, with which it is connected by a railway bridge of 222 arches. On the sea side, separating the lagoon from the open sea, are long narrow stretches of sand-hills, known as *lidi*, strengthened in places by masonry bulwarks. Both the *lidi* and the coast behind the town are defended by strong forts. Besides the canals, which to a large extent take the place of streets in Venice, there are numerous narrow lanes (*calli*) between the houses. The broadest street is the Corso Vittorio Emanuele in the north, and the most important business street is the Merceria, lined by handsome shops, which opens into the Piazza S. Marco. The buildings are mostly erected on piles. The main part of the city is traversed by the Grand Canal, about 2 miles long and from 33 to 66 yards in width, which proceeds from the south-east to the railway-station in the

north-west by a winding course, somewhat like a letter S. It is lined along its whole length on both banks by a series of splendid palaces and houses. It is crossed by the famous Rialto bridge, in the centre of the city, built in 1588–91 and consisting of a single marble arch, and by two iron bridges. The tramways and cabs of other towns are represented in Venice by the gondolas, barcas, and steam launches which ply on the canals. The chief square is the Piazza S. Marco (St. Mark is the patron saint of Venice) on the south-east, continued by the smaller Piazzetta to the bank of the Canale di S. Marco, and lined by some of the chief buildings of the city. It is the fashionable promenade of the Venetians and the centre of the city's life. Of islands not forming part of the main mass of the city the chief are Giudecca, on the south, separated from Venice proper by the Canal della Giudecca; Isola di S. Giorgio Maggiore, immediately east of the former, and separated from Venice by the broad Canale di S. Marco; Isola di S. Pietro, east of the main group of islands; Murano, a mile and a half to the north, with an ancient glass industry; Cemetery Island, to the north-east; Burano, to the north-east, with lace-factories; Torcello, to the north-east, with an interesting cathedral; S. Lazzaro, to the south-east, with an Armenian Mechitarist monastery; and S. Servolo, to the south-east, with the lunatic asylum of the province.

**Churches.**—The greatest church of Venice is the cathedral of St. Mark, on the east side of the square of the same name. It was begun in 830 as a brick basilica in Romanesque style and was rebuilt after a fire in 976. It was elaborately decorated and transformed into a Byzantine building in the succeeding two or three centuries, and in the fifteenth century Gothic elements were added. In its present form it is a Greek cross surmounted by a dome at the end of each arm and one in the centre, and it contains about five hundred columns, mostly in Oriental style, with richly ornamented capitals. The interior is adorned with a great profusion of splendid mosaics and also by other artistic productions of great beauty, such as the bronze monument of Cardinal Zeno and the Pala d'Oro, an altar-piece exquisitely worked with jewels on plates of gold and silver. Near the cathedral stood till its fall in 1902 the square Campanile, or bell-tower, 322 feet in height, with fine bronze statues and gates, and here is the clock-tower, with two bronze giants for striking the hours. Among other churches are the following:—SS. Giovanni e Paolo, a splendid Gothic domed building erected in 1340–1430, containing the burial-vaults of the doges and many magnificent monuments; S. Maria Gloriosa dei Frari, a beautiful cruciform structure in Italian-Gothic style, erected in 1250–1338, containing some splendid monuments and several of the finest works of Titian and Giovanni Bellini; S. Salvatore, completed in 1534 (façade later) and recently restored, containing Titian's Annunciation; Madonna dell' Orto, with a beautiful façade in late Gothic style, and containing many fine pictures by Tintoretto and others; S. Zaccaria, built in 1457–1515 in the style of the Gothic-Renaissance transition, with fine pictures; S. Maria Formosa, an early cruciform church, often rebuilt, with good pictures by Palma Vecchio and others; S. Maria dei Miracoli, erected in the style of the Early Renaissance in 1481 (restored), adorned with marble outside and beautifully decorated in the interior; S. Giacomo di Rialto, the oldest church of the city, now closed; S. Rocco (1490, restored 1725), containing many of Tintoretto's works; S. Sebastiano (1506–18; restored), containing the tomb of Paolo Veronese and fine paintings by him; S.



**Maria della Salute**, erected in 1631-32 in memory of the plague, including works by Titian and others; **S. Giorgio Maggiore**, on the island of the same name, begun by Palladio in 1560, with a very beautiful interior; **Il Redentore**, on the Giudecca, erected by Palladio in 1576; **S. Giovanni Crisostomo**, in Renaissance style, containing fine paintings by Giovanni Bellini and Sebastiano del Piombo; **S. Marciliano**, notable for works by Titian and Tintoretto; **S. Caterina**, with a splendid altar-piece by Paolo Veronese; the **Jesuits' church**, in baroque style (1715-30), and splendidly decorated, with a fine altar-piece by Titian; **S. Giorgio degli Schiavoni**, with Renaissance façade, and containing fine paintings by Carpaccio; **S. Pietro di Castello**, on S. Pietro island, the cathedral of the city till 1807; **S. Giovanni Elemosinario** (1527), containing a splendid altar-piece by Titian; &c. There are also churches for Anglicans, Scottish Presbyterians, Waldensians, German Protestants, Greek Catholics, Armenians, Jews, an Italian Free Church, &c.

**Palaces.**—The *Procuratie Vecchie*, so called because the procurators of the republic formerly dwelt in them, are an imposing group of buildings on the north side of the Piazza S. Marco, and directly opposite them are the *Procuratie Nuove*, which together with the magnificent library building now form the royal palace. The *Procuratie Vecchie* were built in 1496-1520, and the *Procuratie Nuove* were begun in 1584. The library was begun by Sansovino in 1536 and is one of the finest non-ecclesiastical buildings in Italy. Its interior is adorned with ceiling and wall paintings by Paolo Veronese, Tintoretto, Schiavone, and others. Facing the old library, on the opposite (eastern) side of the Piazzetta, stands the **Palazzo Ducale** or **Palace of the Doges**, which was first erected in 800 and has been rebuilt in styles of ever-increasing grandeur after five destructions. The exterior consists of two arcades, one above the other, and is adorned with coloured marbles. It was restored in 1873-89. The **Porta della Carta**, a portal next to the cathedral, the incomplete court, and the flight of steps leading up to the palace (**Scala dei Giganti**) deserve special mention. The interior is very fine and contains a splendid collection of works by Tintoretto, Paolo Veronese, and other great Venetian masters, including the **Paradise of the first named**, which is the largest oil-painting in the world. The building also includes the **Library of St. Mark**, with its many manuscript and other treasures, and an archaeological museum. The famous **Bridge of Sighs** (**Ponte dei Sospiri**) leads from the Palace to the **Prigioni Criminali**, or prison for ordinary criminals, built in 1512-97 and still in use. The palaces along the banks of the Grand Canal are of all styles from Romanesque to Late Renaissance, among them being the following: **Palazzo Corner della Cà Grande** (1532), now the seat of the prefecture; **Pal. Grimani** (Ren.), a very fine building, now containing the **Court of Appeal**; **Pal. Farsetti** and **Pal. Loredan** (Rom.), both now used by the municipal authorities; **Pal. Rezzonico** (17-18th century), in which Robert Browning died; **Pal. Foscarini** (Gothic), now containing a higher commercial school; **Pal. Cappello-Layard**, the former residence of Sir H. A. Layard; **Pal. Bernardo**, said to be the oldest building of the city, now a mosaic factory; **Fondaco de' Tedeschi**, a German warehouse from the beginning of the thirteenth century, now the chief post and revenue office; **Pal. Cà Doro** (Gothic), now the French consulate; **Pal. Vendramin Calergi** (Early Ren.), one of the finest of all, the place where Wagner died; **Paul de' Camerlenghi** (Early Ren.), the former residence of the treasures of the republic; and the **Fondaco de' Turchi** (Rom.), once

a Turkish warehouse, now containing the municipal museum.

**Monuments.**—These include: in the **Piazza San Marco**, the pedestals of the flag-staffs (1506) and the marble sarcophagus, supported by lions, of **Daniele Manin**, the head of the short-lived republic of 1848; in the **Riva degli Schiavoni**, a marble-paved quay along the north bank of **St. Mark's Canal**, an equestrian statue of **Victor Emmanuel II.** (1887); in the **Campo S. Bartolommeo**, a bronze statue of **Carlo Goldoni** (1883); in the **Campo S. Fosca**, a bronze statue of **Fra Paolo Sarpi** (1892); beside the church of **SS. Giovanni e Paolo**, an equestrian statue of **Bartolommeo Colleoni**, modelled by **A. Verrocchio** (d. 1488) and cast in bronze by **A. Leopardo**, on a marble pedestal designed by the latter (1490-95), considered by **Ruskin** the finest work of sculpture in the world; south of the arsenal, **Benvenuti's monument** (1885) in commemoration of the service of the soldiers in the inundation of 1882; a bronze monument to **Garibaldi** (1887) at the entrance to the public gardens; and a marble statue of **Niccolò Tommaseo** (1882) in the **Campo Francesco Morosini**.

**Educational Institutions, Collections, Gardens, &c.**—The **Accademia di Belle Arti**, at the southern end of the older iron bridge over the Grand Canal, contains a priceless collection of paintings by Venetian masters, including **Titian** (his masterpiece is here), **Paolo Veronese**, **Giovanni** and **Gentile Bellini**, **Palma Vecchio**, **Rocco Marconi**, **Pordenone**, **Cima da Conegliano**, **Paris Bordone**, **Carpaccio**, **Tintoretto**, and **Tiepolo**. The **Reale Istituto di Belle Arti** is situated beside the academy. The **Royal Institute of Sciences, Arts, and Industry** occupies one of the palaces on the Grand Canal. The **Museo Civico Correr**, in the **Fondaco de' Turchi**, comprises both the former municipal and the **Correr** collection. The town also has lycæums and gymnasias, an Armenian educational institute, a **Seminario Patriarcale**, containing some sculptures and pictures, technical schools, a higher commercial school, school of industrial art, a deaf-mute school, conservatory of music, atheneum, observatories, and other similar institutions. The **Giardini Pubblici**, in the south-east, were laid out by **Napoleon** in 1807 on the site of monasteries which he caused to be demolished; other gardens are the **Giardino Reale**, behind the royal palace, and the **Giardino Papadopoli**, at the northern end of the Grand Canal. The chief theatre of the town is **La Fenice**.

**Public and Commercial Buildings, &c.**—Among these are: the archives building, beside the **Frari church**, containing about fourteen million documents from 883 downwards; the **Zecca** or mint (1536), beside the royal palace; the customs-house, at the south-east end of the Grand Canal; the branch of the **Banca d'Italia** in the **Palazzo Manin**; the **Monte di Pietà** or pawn-office, in the **Pal. Corner della Regina**; the arsenal, in the south of the city, with stocks for ship-building and large graving-docks; the chamber of commerce; telegraph office; military prison; barracks; &c. New water-works were completed in 1890. The public hospital is a large building beside the church of **SS. Giovanni e Paolo**, and the city also contains a military and a naval hospital, lunatic asylums, orphanages, a home for foundlings, houses of correction, and other institutions of a like kind.

**Manufactures, Trade, &c.**—In addition to the glass and lace industries on the islands of **Murano** and **Burano**, there are in the city manufactories of glass and glass beads, silk-stuffs, cottons, woollens, tobacco, soap, wax, furniture, gold and silver wares, matches, artificial flowers, machinery, torpedoes, &c.

Ship-building is also a growing industry. The trade of Venice, though far less important than in the fifteenth century, has been steadily growing for many years, and is now considerable. The number of ships which entered the port in 1900 was 3097, with a total tonnage of 1,288,940. The annual exports and imports to the United Kingdom each exceed £1,000,000. Vessels enter from the sea through the Porto Malamocco and the Porto Lido.

**History.**—The foundation of Venice is attributed to the inhabitants of the surrounding districts, who fled from the cruelty of Attila the Hun and took refuge among the islets off the mouth of the Brenta. Here, about the middle of the fifth century, they founded two small towns called Malamocco and Rivoalto, and devoted themselves to commerce. In 697 Paulucio Anafesto was elected the first doge or duke. In 819 the seat of government was transferred from Malamocco to Rivoalto (Rialto), and the adjacent islands were connected by bridges. The Crusades (1096–1271) gave lucrative employment to the shipping of the Venetians, and enabled them to make large additions to their territory. In 1204 the Doge Enrico Dandolo conquered Constantinople with the aid of the French Crusaders. In consequence of this the Byzantine Empire was divided, and the coast districts of the Adriatic and the Levant, together with numerous islands, including Candia, fell to the share of Venice. Under the successors of Dandolo Genoa contrived to wrest from Venice her eastern conquests. In 1355 the Doge Marino Falieri, who plotted the overthrow of the aristocratic form of government, was beheaded. During the dogeship of Andrea Contarini (1367–82) Padua, Verona, Genoa, Hungary, and Naples leagued themselves against Venice, which, after a severe struggle, lost all its possessions on the mainland. The tide of fortune, however, soon set again in favour of the Venetians. In 1386 they captured Corfu, Durazzo, Argos, &c.; in 1405 their general, Malatesta, conquered Vicenza, Belluno, Feltre, Verona, and Padua; in 1408 they gained possession of Lepanto and Patras; and in 1409 of Guastalla, Casalmaggiore, and Brescello. In 1416 the Venetian fleet under Loredan defeated the Turkish at Gallipoli, and in 1421 subjugated all the towns on the Dalmatian coast. The close of the fifteenth century is the culminating point in the history of Venice. It had a population of 200,000, and was the centre of the entire commerce of Europe. With the commencement of the sixteenth century its power began to decline. Its commerce was gradually superseded in a great measure by that of the Portuguese in consequence of the discovery of the new sea-route to India. A league to subdue the republic was formed at Cambrai in 1508 between Pope Julius II., the Emperor of Germany, and the Kings of France and Spain. Once again all its possessions on the mainland were taken from it. The work of destruction was all but completed by warfare with the Turks, at intervals from 1649 to 1718, during which the Morea and the islands of Cyprus and Candia were lost, and with them the ascendancy in the Levant. After the French revolution it refused to enter into an alliance with Buonaparte, and the French took possession of the city in 1797. It subsequently became part of the Austrian Empire, of Napoleon's Kingdom of Italy, and of the Lombardo-Venetian Kingdom under Austria, in which last it continued from 1815 to 1866. A revolution broke out in 1848, when the citizens endeavoured to re-establish their ancient form of government under the presidency of Manin, but after suffering from a fifteen months' siege by the Austrians, and from internal dissension, it was compelled to capitulate. In consequence of the misfortunes of

Austria in her war with Prussia in 1866 the city and province were ceded to Napoleon III., under whose auspices they were united by a plebiscite to the Kingdom of Italy. The greatest names in Venetian art are those of the Lombardi (fifteenth and sixteenth centuries), Jacopo Sansovino (1477–1570), Andrea Palladio (1518–80), Vincenzo Scamozzi (1552–1616), and Baldassare Longhena (1604–75) in architecture; the Massegne (about 1400), the Buon (fifteenth century), the Rizzi (fifteenth century), the Lombardi Alessandro Leopardi (d. 1522), and Jacopo Sansovino in sculpture; the Vivarini (fifteenth century), Jacopo Bellini (d. 1464), Carlo Crivelli (d. 1493), Gentile Bellini (1427–1507), Giovanni Bellini (1428–1516), Vittore Carpaccio, Cima da Conegliano, Giorgione (d. 1510), Jacopo Palma Vecchio (1480–1528), Tiziano Vecelli (Titian, 1477–1575), Sebastiano del Piombo (1485–1547), Rocco Marconi, Giovanni Antonio da Pordenone (1483–1539), Paris Bordone (1500–70), Jacopo Tintoretto (1518–94), Paolo Veronese (1528–86), Palma Giovane, and Giovanni Battista Tiepolo (1693–1770) in painting. Among the best guides to this wonderful city, its history and its art are Ruskin's *Stones of Venice*, and works by H. F. Brown, Hare, Howells (*Venetian Life*), Mrs. Oliphant (*The Makers of Venice*), and Wiel (*Story of the Nations*). Pop. in 1901, 151,841.

VENICE, GULF OF. See ADRIATIC SEA.

**VENOMOUS ANIMALS.** Among the various contrivances for offence and defence found among animals the presence of a poison-apparatus, consisting of a poison-gland and a 'fang' or organ for inflicting a wound and introducing the poison into the body of the prey, is a noteworthy feature. In some of the lower forms of animal life, such as in certain Infusorians (see PROTOZOA), and in Cœlenterata more especially, peculiar stinging-cells, termed thread-cells, *cnidæ*, or *nematocysts*, are developed in the tissues. Each thread-cell consists of a sac, containing fluid, and having a filament or thread coiled up therein. On being subjected to irritation the thread-cell ruptures, and its fluid contents exude, whilst the thread is also everted, and may be conceived to play the part of a dart, whilst the fluid is certainly of irritating nature. By means of such a poison-apparatus the Medusæ or Jelly-fishes sting severely and capture their prey; whilst Sea-anemones (which see), Zoophytes, Hydreæ, and allied organisms are also provided with thread-cells. In Centipedes (Scolopendridæ) a poison-apparatus is contained within the mouth, one pair of maxillipedes or foot-jaws being furnished with a hooked fang which communicates with a poison-gland. Amongst Insects—such as the Bees, Hornets, Ants, &c.—the *aculeus* or sting is formed by a modification of the abdominal appendage, and consists essentially of sharp filaments, perforated for the transmission into the wound they make of a poisonous or irritating fluid, secreted by a special gland. The well-known poisonous powers of spiders reside in the poison-apparatus formed by the poison-fang borne on each of the mandibles or principal jaws, and which communicates internally with a poison-gland situated in the mandible itself. In the allied Scorpions the poison-gland is situated in the last segment of the jointed tail, the fang being formed by the modified *telson* or last segment of the body. Amongst higher animals the Serpents or Ophidia (see SERPENTS) constitute the chief group in which a venomous apparatus is present. In these animals certain modified teeth of the upper jaw form hollow or *canaliculated* fangs, which communicate with the poison-glands, formed by modifications of the salivary glands. The venom of serpents appears to act by altering the constitution of the blood in some way not understood, and by

preventing the due purification of the blood by its action on the blood-corpuscles. The bite of scorpions and other animals above mentioned is not fatal to man, save under very exceptional circumstances. And it may be remarked that in all cases the venomous matter must be introduced *directly* into the circulation to produce its effects. Thus, for example, a person may swallow the poison of a snake without experiencing any evil effects, the process of digestion depriving the matter of its properties, which act so powerfully when introduced into the system directly, as through a wound.

**VENTILATION.** See **WARMING AND VENTILATION.**

**VENTNOR**, a pleasure-resort of England, on the south-east coast of the Isle of Wight, 8 miles south-south-east of Newport. It is beautifully situated on a terraced site, and enjoys an excellent climate. Besides churches and chapels, it has a Benedictine convent school; a literary and scientific institution, with library and museum; Albert hall; convalescent homes; and the usual appurtenances of a sea-side holiday resort, such as hotels, boarding-houses, esplanades, pier, park, &c. Pop. (1891), 5817; (1901), 5866.

**VENTRILOQUISM**, the art of speaking in such a way as to cause a hearer to believe that the sound comes not from the person speaking but from a different source. The name (Latin, *venter*, belly, and *loqui*, to speak) originated from the erroneous supposition that the sounds uttered were formed in the belly, whereas practice alone is necessary to carry this act of illusion to a high degree of perfection. The sounds are formed by the same organs as the emissions of sound commonly—the larynx, the palate, the tongue, the lips, &c. The art of the ventriloquist consists merely in this:—After drawing a long breath he breathes it out slowly and gradually, dexterously modifying the sound of the voice by the muscles of the larynx and the palate; besides this he moves his lips as little as possible, and by various contrivances diverts the attention of his auditors. This art was known to the ancient Greeks.

**VENUE**, in English law, the place or county where an action is to be tried, and from whence juries are to be summoned for trial of causes. In local actions, as of trespass and ejectment, the venue is to be from the neighbourhood of the place where the lands in question lie; and in all real actions the venue must be laid in the county where the property is for which the action is brought.

**VENUS**, the Roman name of the goddess of love, identified by the Romans with the Greek goddess Aphrodītē. In the *Iliad* she is described as the daughter of Zeus and Dīōnē, but Hesiod represents her as the offspring of Uranus, born among the foam (Greek, *aphros*) of the sea. She surpassed all other goddesses in beauty, and hence received the apple which was to be awarded to the most beautiful by Paris. She was the wife of Hephestos (Vulcan), but would scarcely be considered a faithful consort, as she bestowed her love on the gods Arēs, Dionysos, Hermes, and Poseidon, and the mortals Anchises and Adonis. Among her children were Eros (Cupid), Anteros, Hymen, and Hermaphroditus. She had the power of granting beauty and irresistible charms to her votaries. Among plants the myrtle, rose, poppy, apple, and other fruits were sacred to her, and among animals the dove, sparrow, swan, swallow, ram, hare, and tortoise. The chief places of her worship in Greece were the islands of Cyprus and Cythera. Before she was identified with the Greek Aphrodītē, Venus, the Roman goddess, was one of the least important in the religion of the Romans, yet her worship seems to have been established in

Rome at an early period. Here several temples were erected to her at different times and under different names. In the best days of art this goddess was sometimes represented draped, at other times nude. The most celebrated ancient statue of Aphrodītē was that in Chnidus by Praxiteles; there are copies of it in the Vatican and at Munich. Other celebrated statues are the Venus of Milo, in the Louvre, and the Venus de' Medici, at Florence.

**VENUS**, the second planet in order of distance from the sun. The mean distance of Venus from the sun is 67,200,000 miles; its orbit has an eccentricity of '00686, and the plane of its orbit is inclined to the plane of the ecliptic at an angle of 3° 23' 31". Its year is 224·700787 days, and it is in conjunction at intervals of 583·92 days. The volume is about '975, and the mass of Venus is about '855 of that of the earth. Venus increases in brightness as it moves from that position which corresponds to the phase of new moon, as the bright side of the planet turns towards us; but the distance between us and Venus also increases at an increasing rate, so that the apparent diameter becomes smaller; a point is reached when the rate of increase of brightness is equal to the rate of decrease of apparent diameter, and then the planet is brightest; a corresponding position occurs after it passes the full phase. Schiaparelli's observations led him in 1890 to the conclusion that the day and the year of Venus are alike.

A transit of Venus means a passage of the planet across the solar disc seen from the earth. During a transit, suppose an observer can note the position of the planet at a particular instant on the sun's face, and that another observer at a different station can note the position of the planet at the same instant, the difference of the observed positions in connection with the distance of the observers apart gives a means of calculating the distance of the sun from the earth. A transit of Venus occurred in 1874, and there was again another in 1882. From these the sun's distance has been more accurately obtained than before.

**VENUS'S FLY-TRAP.** See **DIONÆA.**

**VERA CRUZ**, a seaport of Mexico, in the state of the same name, on the coast of the Gulf of Mexico, about 180 miles east by south of Mexico. It is entered by four railways, and has a system of street tramways. In 1902 a series of breakwaters forming a well-sheltered harbour with entrance from the south was completed. There is a quay-wall with a depth of 25 feet at low water alongside it, and a number of piers with all requisite appliances. Among the buildings are churches and convents, hospitals, a custom-house, a post and telegraph office, an amphitheatre, and a theatre. The site is unhealthy, but the new sewage and waterworks, which will be completed in 1903, are expected to produce a great improvement. Most of the foreign trade of Mexico goes through this port, the imports and exports for 1900–1901 being valued at £4,469,957 and £2,195,489 respectively. The chief articles of export are ores and precious metals, coffee, tobacco (including manufactured), beans and peas, broom root (for brushes), and hides; the principal imports are textiles, metals and hardware, machinery, raw cotton, jute, &c., wines, spirits, and aerated waters, animals and animal products, paper and paper goods, and chemicals. Pop. (1895), 24,085.

**VERATRIN.** See **SABADILLA.**

**VERBENA.** See **VERVAIN.**

**VERCELLI**, a town of North Italy, in the province of Novara, near the right bank of the Sesia, 44 miles w.s.w. of Milan by rail. It has generally narrow and winding, with a few spacious and handsome streets; a cathedral, a castle, now converted

into courts of justice; a richly endowed hospital, cavalry-barracks, &c., flourishing manufactures and trade. Pop. without suburbs (1881), 20,165.

**VERDE, CAPE.** See **CAPE VERDE**.

**VERDICT.** See **JURY**.

**VERDIGRIS**, a poisonous substance, prepared by exposing copper to the air in contact with acetic acid, and used as a pigment, as a mordant, in medicine, &c.

**VERDITER**, a blue pigment, prepared by dissolving verdigris in acetic acid.

**VERDUN**, a fortified town of France, in the department of the Meuse, in a valley on the Meuse, 150 miles E.N.E. of Paris. It has a citadel, the work of Vauban, and is defended by eleven detached forts of recent construction. The principal buildings are the cathedral, which dates from the eleventh and twelfth centuries, the bishop's palace, and the hôtel de ville. The liqueurs and confectionery of Verdun are famous. The town was captured by the Germans (after a spirited defence) on 9th November, 1871. Pop. (1896), 22,152.

**VERJUICE**, a sharp vinegar made of the juice of the crab apple. The sour juice of unripe grapes, used for culinary purposes, is also called *verjuice*. Formerly a cooling syrup was made of it for fever patients, but it is now disused for this purpose.

**VERMICELLI** (Italian, 'little worms'), an Italian mixture prepared from flour, with water and a small portion of egg, worked into dough, and formed into tubular thread-like pieces by forcing it with a piston through a number of little holes in a metal plate made for that purpose. It is much used in Italy and other countries, in soups, broths, &c.

**VERMILION**, the name given to a pigment of a bright red colour, obtained from crystallized mercuric sulphide. It is generally prepared by subliming the ordinary sulphide.

**VERMONT**, one of the United States of North America, bounded on the north by Canada; on the west by New York, from which it is partly separated by Lake Champlain; on the south by Massachusetts; and on the east by the Connecticut river, separating it from New Hampshire; area, 9565 square miles. The surface is for the most part hilly and mountainous, being traversed by the Green Mountains (French, *Verts Monts*) which give the state its name, and, entering from Massachusetts, stretch across it centrally south to north. They attain their greatest heights in the north-west, where Camel's Hump, midway between Burlington and Montpelier, is 4190 feet high; and Mansfield Mountain, a few miles farther north, is 4389 feet. The drainage is shared between Lake Champlain and the Connecticut. Marble, granite, slate, and soapstone are extensively worked in the state. The soil is generally fertile, consisting, more especially in the valleys, of a deep, dark loam; the higher lands are most profitably employed in grazing. The climate, though generally healthy, has a wide range of temperature, rising in summer to 94°, and sinking in winter as low as 20° below zero. Nearly three-fourths of the inhabitants are employed in farming and grazing, but the manufacture of cotton and woollen goods, leather, organs, agricultural implements, iron, &c., is yearly increasing. The foreign trade is limited, and is for the most part carried on through New York and Massachusetts; but the internal and transit trade are considerable. The government is vested in a governor, executive council, senate, and assembly, all elected annually by universal suffrage. At the head of the educational system is the University of Vermont at Burlington. Montpelier is the capital, but Burlington is the largest town. Vermont was first settled by emigrants from Massa-

chusetts, and became a member of the Union in 1791. Pop. (1890), 332,422; (1900), 343,641.

**VERNET, JEAN EMILE HORACE**, commonly called **HORACE VERNET**, a French painter, grandson of Claude Joseph Vernet, the distinguished painter of sea-pieces and seaport scenes; and son of Antoine Charles Horace Vernet, better known as Carle Vernet, an eminent painter of battle and genre pictures. He was born in the Louvre, Paris, 30th June, 1789. His first master in art was his father, and even at the age of thirteen he could support himself by the payments received for his drawings. At an early age he executed numerous drawings for booksellers and designs for fashion-books. In 1811 he married, opened a studio, and established a manner of his own. In 1814 he took part in the defence of Paris, and was decorated by Napoleon with the cross of the Legion of Honour. He drew upon himself the ill-will of the government of the restoration by his lithographic caricatures, and in 1822 his works were excluded from the exhibition; this induced him to open a picture-gallery of his own, which was very successful. His rapidly increasing popularity at last induced Charles X. to appoint him to the directorship of the French Academy in Rome, a post which he ably filled till the end of 1834. On his return to Paris Louis Philippe commissioned him to paint the historical galleries of the museum of Versailles, a task which occupied him five years. Among the most remarkable of the pictures are *The Occupation of Ancona*, *The Assault of the Town of Constantine in Africa*, *The Attack of the Citadel of Antwerp*, *The Fleet forcing the Tagus*, &c. In 1840 we find him travelling in Egypt, Palestine, and Syria; in 1842 he accompanied the Emperor Nicholas on a journey from St. Petersburg to Sebastopol; in 1845 he visited Spain and Algeria. In 1853 he followed the French army to Varna, but soon returned to Paris, and produced his last great picture, *The Battle of the Alma*. He died 17th January, 1863. To the above-mentioned works must be added, *The Dog of the Regiment*, *The Soldier of Waterloo*, *The Battles of Jemappes*, *Montmirail*, *Fontenoy*, *Wagram*, *The Capture of La Smala*, *The Prayer in the Desert*, *The Council of Arabs*, &c. Vernet attempted Biblical subjects several times—*Rebecca at the Fountain*, *Abraham dismissing Hagar*, *Judith with the Head of Holofernes*—but with less success.

**VERNIER**, an index fitted to slide along the edge of a scale (as that of a barometer) and having divisions marked upon it, by means of which readings may be taken to small fractions of the parts actually marked on the scale. Suppose we have a scale of inches and tenths of an inch, and suppose the index is  $\frac{7}{10}$ ths of an inch, and divided into 10 divisions. Suppose that in taking a reading the end of the index is past the 8 figure on the scale we write down 8, that it is past 8 of the tenth spaces and part of another we add '3, then looking up the index we find that its 6th division most nearly coincides with a division on the scale and we add '06, and so the position of the index is taken as marking 8·36 inches.

**VERONA**, a city of Northern Italy, capital of the province of the same name, 72 miles west of Venice by rail, beautifully situated where the last slopes of the Alps merge into the plains of Lombardy, on both sides of the Adige, which traverses the city in a wild and rapid torrent, and is crossed here by six bridges. The town is surrounded by lofty walls flanked with towers and bastions, and is entered by five gates remarkable alike for solidity and beauty. Many of the streets, though narrow and crooked, are lined by splendid mansions, particularly rich in marble decorations, and there are several elegant squares. Among the more interesting buildings is the Roman amph-

theatre, occupying one side of the Piazza-Bra; it is supposed to have been built in the second or third century of our era. The interior is nearly perfect; it is in the form of an ellipse, the transverse axis of which is 510 feet, and the conjugate 410 feet; it is 106 feet high, and on the forty-five tiers of steps 27,000 spectators could be accommodated. There are about fifty churches, many of them magnificent specimens of Gothic architecture, rich in paintings and other art treasures. The cathedral is an imposing Gothic structure of the fourteenth century, with a choir and Romanesque façade of the twelfth; the church of St. Zeno is a Romanesque basilica of noble proportions, with some interesting old statues and reliefs; those of St. Anastasia, St. Giorgio, and St. Fermo Maggiore, should also be mentioned. The Palazzo del Consiglio, in the Piazza del Signori, dates from the beginning of the sixteenth century; it is adorned with statues of celebrated natives of the town, among whom are Cornelius Nepos, Catullus, Pliny the Younger, and Vitruvius. Close by are the imposing Gothic tombs of the Della Scala family (known also as the Scaligeri), who for upwards of a century (1262-1389) were the lords of Verona. There are several theatres, a museum with a valuable collection of antiquities, a public library, hospitals, and numerous literary and artistic institutions. The town carries on manufactures of silks, woollens, hats, &c., and has an important trade.—Verona is supposed to have been founded in the fourth, and to have been subjected to the Romans in the second century B.C. On the decline of the Roman Empire it was taken by the Goths, and made by Theodoric (in German legends Dietrich of Bern, that is Verona) the capital of his empire. In 774 it was captured by Charlemagne, and took a lead among the Italian cities while the power of the emperors in Italy lasted. It afterwards became an independent republic, but suffered much from the dissensions of its nobles, a state of affairs depicted by Shakspeare in *Romeo and Juliet*. Weary of the vicissitudes to which it had been subjected, it voluntarily ceded itself to Venice, under which it remained from 1405 to 1797. It then passed into the hands of the French, afterwards into those of the Austrians, and along with the rest of Venetia was incorporated with Italy in 1866. Up to this time it was possessed of great strategic importance to the Austrians, as it formed a member of the celebrated 'Quadrilateral,' or four mutually supporting fortresses (Mantua, Verona, Peschiera, and Legnago) which secured the Austrian position in Northern Italy, and formed the key to the Tirol from the south. Pop. (1881), 60,678; (1901), 74,261.

VERONESE, PAUL. See CAGLIARI (PAUL).

VERSAILLES, a town of France, capital of the department of Seine-et-Oise, in a plain, 11 miles s.w. of Paris. It may be regarded as a town of royal construction, having risen up rapidly, regularly, and with great magnificence under the auspices of the sovereigns of France, particularly Louis XIV., who made it the seat of his court, and lavished immense sums on its embellishment. It is justly regarded as one of the handsomest towns in Europe. The palace is the most conspicuous edifice in the town, though somewhat monotonous in appearance. It was built by Louis XIV., but ceased to be a royal palace at the revolution of 1793, and Louis Philippe converted it into a national museum. It is filled with an immense collection of statues and paintings intended to represent all the principal personages and events connected with French history from Clovis downwards. The principal façade, situated towards the garden and park, is over 400 yards long. The park, both in extent and embellishment a fit accompaniment of the palace, attracts crowds of visitors.

Versailles was the German head-quarters in Sept.-March, 1870-71, and the seat of the French government from the peace till 1879. Pop. (1901), 54,081.

VERSE, a measured and cadenced form of speech or composition, usually adopted in poetry. The origin of verse is lost in antiquity. It seems to be the natural language of passion, yet it has unquestionably been improved and developed by art. It is doubtful if the verses of Hebrew poetry were measured, or had more of the mechanical form of poetry than an irregularly recurring cadence. The use of rhymed cadences is a comparatively modern invention. (See RHYME.) The multiplication of poetry and the growing fastidiousness of taste have constantly tended to increase the varieties of verse. Grammarians have elaborately classified these, and analytically distinguished the possible divisions of words into bars of accented and unaccented syllables. (See RHYTHM.) A mechanical adherence to a uniform measure is, however, irksome in poetry as well as in music; and poets who are gifted with any command of language vary their verse as their own feelings dictate. These arbitrary changes it is impossible to classify. Modern French and Italian verse is always rhymed. In England and Germany there are the varieties of blank verse and rhyme. The former is commonly in ten syllables or hexameters.

VERST, a Russian measure of length, equal to 3500 English feet, or very nearly two-thirds of a mile.

VERTEBRA. See SPINE.

VERTEBRATA, the name given to the highest sub-kingdom of animals, and also used to indicate them in contradistinction to the numerous groups of lower animals, which are collectively termed Invertebrata (which see). The Vertebrate group includes five classes. These, beginning with the lowest, are named the Pisces or Fishes, Amphibia (Frogs, Newts, &c.), Reptilia or Reptiles (Lizards, Crocodiles, Serpents, and Tortoises), Aves or Birds, and Mammalia or Mammals, including Man himself. The characters of these classes are fully considered in the respective articles devoted to them. It remains, however, in the present instance that the general characters of the sub-kingdom, and of its main subdivisions, should be briefly indicated. The first character of Vertebrate animals is the possession by them all, in their early life, of a notochord (which see) or *chorda dorsalis*, a structure in the great majority of cases replaced by the spine or backbone. It is not strictly correct to say that Vertebrata are backboneed animals, since some of them (such as the Lancelet, Lampreys, Mudfishes, and other fishes) do not possess a spine even in adult life—the place of the spine being supplied by the notochord, which thus persists in these cases throughout life. The presence of the notochord in the early life-history of all Vertebrates is therefore to be taken as one of the chief characters of the group. A second character of importance is found in the specialization of the great nerve-centres of these animals. In all Vertebrates the nervous system is shut off or differentiated from the general cavity of the body, being usually contained within a special case formed by the skull and spinal column. Nothing homologous or corresponding to this disposition of parts is seen in Invertebrata, and therefore the dorsal inclosed nerve-masses of Vertebrates form structures unrepresented in lower animals. The limbs of Vertebrata are always developed in pairs. They are supported by an internal (appendicular) skeleton derived from the body (axial) skeleton; and are further turned away from that (dorsal) aspect of the body in which the nerve-centres are situated. The jaws of Vertebrata always form parts of the head, and are never (as in Insecta, Crustaceans)

represented by modified limbs, or (as in Molluscs) by hard structures developed in the lining membrane of the alimentary canal. The *digestive system* in Vertebrata is not, as in Invertebrata, embraced by the chief nervous centres, but opens on the surface (ventral) of the body, opposite to that wherein the nervous system is disposed. In all Vertebrata (with the single exception of the Lancelet) a distinct *heart* is developed, and in all save the Lancelet the blood is red. In Vertebrata part of the venous blood returning to be purified in the breathing organs (gills or lungs) is diverted to the liver, there to be elaborated into bile. This supply of venous blood is carried to the liver (which see) by a special set of veins named the *portal veins*, and hence the presence of a *portal system* of veins is another character of the highest group of animal life. In Vertebrata also the products of digestion are taken up from the alimentary canal by a special set of vessels (*lymphatics* or *absorbents*—see LYMPH), and poured by these vessels into the current of the blood, so as to renew the latter fluid. As an *absorbent system* is not developed in any Invertebrate its presence is also a characteristic of the Vertebrata.

Certain structures seen in the development of Vertebrate animals are peculiar to the sub-kingdom. Thus at an early stage in development the Vertebrate egg shows a depression (*primitive groove*) on its upper surface. This groove is soon converted into a canal, in the floor of which the notochord is developed, whilst within it the nervous system is formed. The embryo of no Invertebrate exhibits a similar course of development. Then also in the Vertebrate embryo a series of *clefts* named the *branchial clefts* or *visceral arches* appear at the sides of and behind the mouth, and in a transverse direction to the axis of the body. These structures, in Fishes, for example, bear the gills, but in higher Vertebrates become obliterated. Their invariable presence, however, is to be accepted as a distinctive character of these animals.

The classification of Vertebrata into *Branchiates* (Fishes and Amphibians) or those that breathe by gills, and *Abranchiates* (Reptiles, Birds, and Mammals) or those that breathe by lungs, is a simple, but not wholly satisfactory method of subdividing this group, since many other characters of equal value to those furnished by breathing-organs are entirely lost sight of. A better classification is that enumerated in the following table:—

SECTION A. ICHTHYOPSIDA, including Vertebrata which possess *gills* at some period of life; which in their development have no *amnion*, and only a rudimentary *allantois*; and which have nucleated blood-corpuscles.

*Class 1. Pisces* (Fishes)—Vertebrata breathing by *gills* throughout life; having the limbs in the form of *fins*, cold blood, a two-chambered *heart*, and no *amnion* or *allantois*.

*Class 2. Amphibia* (Frogs, &c.)—Vertebrata having *gills* in early life and *lungs* in adult life, the *limbs* never converted into *fins*, two occipital condyles to the skull, and a three-chambered heart.

SECTION B. SAUROPSIDA, including Vertebrata distinguished by the absence of *gills*, the breathing being carried on entirely by *lungs*; by the development of an *amnion* and *allantois*; by the skull having only a single condyle; by the lower jaw being compound, and articulating with the skull by a quadrate bone; and by possessing nucleated blood-corpuscles.

*Class 3. Reptilia*—Vertebrata with cold blood, a mixed circulation, no air-sacs, horny scales or bony plates as body-coverings, fore-limbs not modified for flight, and the tarsal and metatarsal bones of the hind-limbs never united to form a single bone.

*Class 4. Aves*—Warm-blooded Vertebrates with a

four-chambered heart, a body-covering of feathers, the tarsus and metatarsus of the hind-limb ankylosed, fore-limbs generally modified for flight, one aortic arch (the right), and the bronchi opening into air-sacs.

SECTION C. MAMMALIA—Vertebrata having an *amnion* and *allantois*, a body-covering of *hairs*, two occipital condyles, a simple lower jaw and no quadrate bone, mammary or milk glands, and non-nucleated red blood-corpuscles.

*Class 5. Mammalia*—characters those of the section.

VERTUMNUS, a Roman deity who presided over the spring and orchards. He is generally represented as a young man crowned with flowers, covered up to the waist, and holding in his right hand fruit, and a crown of plenty in his left. He was the husband of Pomona.

VERULAM, LORD. See BACON.

VERVAIN (*Verbena*), the typical genus of the order Verbenaceae, which consists of herbs or shrubs with opposite leaves, a more or less two-lipped or irregular corolla, didynamous stamens, and a 2-4 celled ovary. The Common Verbena (*V. officinalis*) has pinnatifid or three-cleft leaves, oblong-lanceolate, sessile, the lobes cut and toothed, spikes panicled, very slender, bracts small, much shorter than the very small purplish flowers. The plant was employed by the ancients in religious ceremonies, and was in equal veneration among the priests of Rome and Greece, the Druids of Gaul and Britain, and the Magi of India. It possesses no known properties to account for such an important position.

VERVIERS, a town of Belgium, province of Liège, on the Vesdre, 14 miles S.E. of Liège, and on the railway between Liège and Aix La Chapelle. It was a fortified town, but the fortifications were destroyed by Louis XIV. It is celebrated for its manufacture of broad-cloth, which is the staple of the town. There are also cotton, leather, and other manufactures. Pop. (1900), 52,203.

VESALIUS, ANDREAS. See SURGERY.

VESPA. See WASP.

VESPASIANUS, TITUS FLAVIUS, Emperor of Rome, was born near Rieti, in the country of the Sabines, in A.D. 9. In the reign of Claudius, being appointed commander of a legion, he acquired great reputation in Germany and in Britain; and on his return to Rome he was made consul. In the beginning of Nero's reign he lived in retirement, but was at length appointed Proconsul of Africa; and on the rebellion of the Jews he was sent with an army into Judea (A.D. 66). After reducing almost the whole of Galilee to subjection he was preparing to attack Jerusalem, when he received the news of the death of Nero (A.D. 68). After the transient reigns of Galba, Otho, and Vitellius, he was elevated to the imperial power. Reaching Rome about the middle of the year 70, he was received with general rejoicing. He reformed the discipline of the army, purified the senatorial and equestrian orders, and appointed a commission to settle the vast multitude of suits which had accumulated during the late troubles, besides presiding on the bench frequently himself, that justice might be administered with impartiality. He was an enemy to luxury, and devoid of personal or family pride, being by no means desirous to conceal the obscurity of his origin. On the other hand, he is charged with displaying a degree of meanness and rapacity in the accumulation of wealth, inconsistent with his character and station. Though this reproach is not destitute of foundation, it appears to be exaggerated, and may have been partly due to an exhausted treasury. Vespasian favoured arts, letters, and learned men, particularly Quintilian,



**Pliny, and Josephus.** He rebuilt a part of the city, restored the capitol that had been burned under Vitellius, with increased splendour, and erected the gigantic amphitheatre, the ruins of which are still celebrated under the name of the *Coliseum*. Among the principal public events of the reign of Vespasian are the termination of the dangerous rebellion of the Gauls under Civilis, and the capture of Jerusalem by his son Titus, whom the emperor had made his lieutenant in Judea. He died in June, A.D. 79.

**VESPER** (Latin), properly the *evening*; at present it is generally used to signify the evening service; hence *vesper bell* and *vesper sermon*.

**VESPER, SICILIAN.** See **SICILIAN VESPER**.

**VESPUCCI, AMERIGO.** See **AMERICUS VESPUTIUS**.

**VESTA**, a Roman divinity, the goddess of the hearth. *Aeneas* was supposed to have brought the eternal fire, by which she was represented, from Troy, along with the Penates. She was worshipped, along with the Penates, at every family meal, when the household assembled round the hearth, which was in the centre of the room. Her public sanctuary was in the Forum, between the Palatine and the Capitoline Hills. It was round, with a vaulted roof, and the sacred fire was kept burning in it by the vestals, her priestesses. The sacred fire was renewed on the 1st of March each year. Her festival was on the 9th of June, and on the 15th her temple was cleared. This was a *dies nefastus*, but marriages were contracted in the afternoon. The vestals are said to have been established by Numa. The e were at first four, and afterwards six of them. They were taken from six to ten years of age. They were bound to virginity for thirty years, the term of their service, after which they were allowed to marry. Their persons were inviolable, and they were treated with great honour, and had important public privileges. The punishment of a vestal who was guilty of unchastity was burying alive.

**VESTMENTS, SACRED**, are the official garments worn by ministers of religion. The priests of almost every religion have been distinguished by some especial garb, at least in their official ministrations, and usually also in common life. Among Catholics and High Churchmen, who believe that Christianity has retained a special priesthood and ritual, much importance is attached to vestments. The majority of Protestants discard these notions, but nearly all the larger bodies distinguish their officials, and especially their clergy, by some sort of uniform, to which a species of sanctity is almost involuntarily attached. For the principal vestments in use in the English and Roman Churches see **CHASUBLE**, **STOLE**, and **RITUALISM**. For Jewish vestments see **HIGH-PRIEST**.

**VESTRY**, a room adjoining a church where the vestments of the clergy are kept. Hence the place of meeting of those who had the charge of parochial affairs, and subsequently the persons themselves to whom these affairs were intrusted. Vestries were originally intrusted with the secular affairs of the church, as the maintenance and repair of the building, and the levying of church rates for this and other purposes. In England they latterly acquired a general control of the affairs of the parish, but by the local government act of 1894 the vestries in rural parishes were superseded as regards their civil powers by the parish council or parish meeting. Vestries in urban parishes remain practically as before, unless where their powers are transferred to an urban district council. The vestries which formerly managed the affairs of the populous parishes of London were done away with by the London Government Act of 1899, under which a number of metropolitan boroughs, each with its own mayor,

aldermen, and council, were established in their place and in the place of other anomalous authorities. Every parishioner rated for relief of the poor is entitled to attend a vestry. A select vestry is a number of parishioners elected by the vestry for a year to manage the affairs of the parish. See **PARISH**.

**VESUVIUS**, a volcanic mountain of Southern Italy, 10 miles S.E. of Naples. It rises in the centre of a plain 2800 feet above the sea, in a pyramidal cone of 1500 feet; total height, 3800 feet. The cone is truncated, and about 2000 feet in diameter. Previous to an eruption about 1838, the top was an uneven plane, but was then converted into a hollow cup, with a rim 400 feet to 500 feet broad on its west side, and not more than 50 feet on the others, and with an internal sloping surface to a depth of 500 feet. A precipitous rocky ridge, forming an arc of a circle, and 1400 feet in height, called the Monte Somma, is situated at a short distance from the cone on the north, from which it is separated by a deep valley called the Atrio del Cavallo. Near the western extremity of this valley an observatory has been established, expressly for watching the volcanic phenomena. The lower part of the sloping plain, which rises gradually from the sea to the foot of the cone, forms a belt of about 2 miles broad along the shore. It is laid out in vineyards and well cultivated, though intersected at intervals by terraces of black calmed matter. Beyond the cultivated belt the plain is rugged and covered with scoriae of all forms and sizes. The cone itself is covered with loose matter composed of scoriae, blocks of lava, and volcanic sand, arranged in successive layers by the natural force of gravitation. The form of the pyramid has been modified by the bursting out of eruptions from the sides, and by the internal force acting upon the external matter before it has cooled. An internal movement of elevation has been proved by the angle at which continuous streams of lava are now found being much greater than that at which they are known to have originally flowed. A stream of lava ceases to be continuous, and breaks into masses of scoriae at an angle of more than 3°. Monte Somma is supposed to have formed at one time a complete cone of much larger dimensions, and probably of greater height than the present cone, being subsequently thrown down by volcanic forces, in the same manner as 800 feet of the present cone was carried away by an eruption of 1822. From a difference of structure implying greater pressure, geologists have concluded that Somma was a submarine volcano, while the present is a subaerial one. Till A.D. 63, when many of the surrounding cities were damaged by an earthquake, no symptoms of activity are known to have been given forth by Vesuvius within human memory. In 79 occurred the great eruption which buried Herculaneum and Pompeii. (See these articles.) Since that time there have been continuous symptoms of activity, and numerous eruptions have taken place. The first recorded discharge of liquid lava after that of 79 was in 1036. Since then there have been many violent eruptions; the most noted were those of 1779, 1793, 1834, 1847, 1850, 1855, 1867, 1872, 1878, and 1880. The eruption of 1779 was particularly magnificent, flames of fire rising to three times the height of the mountain, and stones, scoriae, &c., being projected as high as 2000 feet, while a river of lava 1500 feet wide flowed for three and a half miles and extended 600 feet into the sea. In 1872 fourteen different orifices opened in the mountain sending forth rivers of lava that threatened to carry devastation far and wide. The villages of San Sebastiano and Massa di Somma were almost entirely destroyed. (See Plate at **VOLCANOES**.) A number of persons who had gathered near the observatory lost their



lives by the sudden opening of two cracks which gave vent to stifling fumes and lava. In 1880 a double line of rails was laid to the top, forming a railway which is traversed by one carriage going up while another is going down.

**VETCH** (*Vicia*), leguminous plants, with herbaceous stems, often supporting themselves on surrounding objects by means of the tendrils with which their leaves are terminated. These last are pinnated, and provided with stipules at the base. The flowers are disposed in clusters upon an axillary and more or less elongated peduncle, and are succeeded by pods. In short, the general habit of these plants is precisely similar to that of the pea. Above 100 species are known, most of which inhabit the northern and temperate parts of the European continent. The common vetch, or tare, is extensively cultivated in Europe, and considered a valuable agricultural plant. The crop is cut at the time of flowering, to be given green to cattle; or these are turned into the field to graze. It is an excellent fodder for milch-cows and working stock.

**VETERINARY ART.** This, according to the present acceptation of the phrase, comprehends a knowledge of the external form, as well as the internal structure and economy, of the domestic quadrupeds, the appropriate management of them, the nature, causes, and treatment of their disorders, and the art of shoeing such of them as may require it. The word is derived from the Latin *veterinarius*, which some of the ancient writers, particularly Columella, used to denote a farrier, horse-doctor, or one who lets horses to hire, its radical being the verb *veho* (to carry); whence *veterinarius* was applied to things connected with or relating to beasts of burden. The first veterinary school was instituted in 1762 at Lyons; in 1766, that at Alfort near Paris was opened. A similar institution was established at London in 1791, and in the year following one in Berlin. In Edinburgh, instruction in veterinary medicine began to be given by Mr. Dick in 1819, and in veterinary surgery in 1823. He erected college buildings soon after, collected a museum, and at his death in 1866 left all his fortune to the endowment of this institution. There is also another veterinary school in Edinburgh, and one in Glasgow. In London, besides the older institution now called the Royal Veterinary College, Camden Town, there is a second established at Bayswater in 1865. In 1844 the veterinary surgeons obtained a charter constituting them a corporation under the title of the Royal College of Veterinary Surgeons, and empowering them to appoint examiners and grant licenses or diplomas, the holders of which are members of this body (M.R.C.V.S.). Their powers were extended by subsequent charters, and in 1881 the Veterinary Surgeons Act intrusted them with the registration of all practising veterinary surgeons in the United Kingdom. Penalties are attached to the offence of using the name of veterinary surgeon without being registered. In the army, veterinary surgeons are required to attend to the diseases of the horses in the cavalry and artillery.

**VEVAY**, a town of Switzerland, in the canton Vaud, beautifully situated at the north-east margin of the Lake of Geneva, 11 miles E.S.E. of Lausanne. It is celebrated for its manufacture of cigars. The beauty of the town and neighbourhood attracts many foreign residents. Pop. 10,000.

**VIADUCT.** SEE BRIDGE and RAILWAYS.

**VIATICUM**, literally provision for a journey; in Roman Catholic theology, the eucharist administered to patients beyond hope of recovery. Protestants also often take the Lord's supper before death, but do not give this name to it.

**VIATKA**, a town of Russia, capital of the government of same name, advantageously situated near its centre in a beautiful district at the confluence of the Klinovka with the Viatka, 500 miles E.N.E. of Moscow. Its houses are surrounded by gardens, and there are also public gardens. It has two cathedrals and also monasteries. There is steamer communication with Kazan. Pop. (1897), 24,894.—The government has an area of 59,172 square miles. The chief river is the Viatka, which joins the Kama, a tributary of the Volga. There are low hills, especially in the north. Flax and hemp are important crops, and among the chief minerals are iron and copper, which are extracted and smelted. There are also other manufactures. Pop. in 1897, 3,082,788.

**VIBRIO**, the name that used to be given to organisms of microscopic size which appear in infusions of organic matter, and which are believed to represent low forms of vegetable life, including different kinds of bacteria. These organisms consist of elongated filaments, composed of numerous joints. The presence of these organisms in fluids was one of the chief points under discussion in the controversy regarding *spontaneous generation*.

**VICAR** (from Latin *vicarius*, substituted, delegated), a representative, a vicegerent. The pope calls himself *vicar of Christ on earth*. A *vicar-apostolic* was formerly a bishop or archbishop of the Roman Church to whom the pope delegated some of his jurisdiction, but the term now denotes a titular bishop in a country where episcopal sees have not yet been established, or where the succession has been interrupted. A *vicar-forane* is a priest appointed by a bishop to exercise a limited jurisdiction in a particular town or district. A bishop may appoint one or more *vicars-general* to assist him in the work of his diocese. In England the vicar is a particular kind of parish priest. See RECTOR.

**VICE-ADMIRAL.** See ADMIRAL.

**VICE-CHANCELLOR.** See CHANCELLOR.

**VICENZA**, a town of Italy, capital of a province of the same name, 49 miles west of Venice, beautifully situated at the confluence of the Retrone with the Bacchiglione. It is surrounded by dry moats, now partly under cultivation, and by dilapidated walls, and is very well built; containing numerous fine mansions, many handsome streets, and several elegant squares, among which the Piazza-dei-Signori, with its campanile, not more than 20 feet square and yet more than 300 feet in height, is conspicuous. The public buildings, though numerous, are somewhat monotonous, being almost all the work of Palladio, who was born here, or of scholars who rather slavishly imitated him. The most remarkable edifices are the Duomo, originally Gothic, but much injured by modern alterations; the Basilica, or Palazzo-della-Ragione, an ancient Gothic building; the Palazzo-Prefettizio, in a rich and fanciful Corinthian style; the Teatro-Olimpico, regarded as the most curious if not the finest work of Palladio; the Museo Civico, the lyceum, public library, and numerous hospitals. The manufactures are silk, woollen, and linen tissues, leather, earthenware, hats, &c. Vicenza (*Vicentia*) was founded above a century before the Christian era, and became a Roman municipal town. Pop. in 1901, 44,261.

**VICENZA**, ARMAND AUGUSTINE LOUIS, DUC DE, a French general and diplomatist, was born at Caulaincourt, 16th September, 1777. He entered the army before the revolution, was sent on a diplomatic mission from Napoleon to Alexander I. in 1801, and acted in a diplomatic capacity on the Rhine in 1804, but he did not attain the rank of general till 1805,

when he was also created Duke of Vicenza and officer of the Legion of Honour. He was ambassador to St. Petersburg from 1807 to 1811. He accompanied Napoleon to Russia in the expedition of 1812, and in 1813 negotiated with the plenipotentiaries of Russia and Prussia the armistice after the battles of Lützen and Bautzen. He was during the same year appointed minister of foreign affairs, and in 1814 as plenipotentiary of Napoleon he negotiated and signed the treaty of 11th April, 1814. During the Hundred Days he again acted as minister of foreign affairs, and issued on 4th April, 1815, the celebrated circular declaring the pacific intentions of the emperor. After the restoration he lived in retirement. He died in Paris on 19th February, 1827.

**VICH**, or **VIQUE**, a town of Spain, in the province of Barcelona, on both sides of the Merder, a tributary of the Ter, 50 miles north of Barcelona. It is a bishop's see and has a cathedral, founded in 1040 and modernized in 1803. Its museum of art and archaeology is of great interest and value. Cotton, linen, and paper are the principal manufactures; copper and coal are found in the vicinity. Pop. in 1887, 11,640.

**VICHY**, a town of France, in the department of the Allier, in a beautiful valley of the river of that name, 32 miles s.e. of Moulins. It was once a place of strength, and is celebrated for its thermal alkaline springs. These are nine in number, and belong to the government. The waters are drunk on the spot, are used for baths, and are bottled for export; and the salts obtained from them by evaporation are manufactured into lozenges. The temperature of the springs ranges from 59° to 106°, and the chief constituent is bicarbonate of soda. The Vichy waters are efficacious in urinary and uterine affections, diabetes, rheumatism, gout, and similar disorders. The town is well provided with the usual accessories of a spa. Pop. (1896), 11,658.

**VICKSBURG**, a city of the United States, capital of Warren county, Mississippi, on the Mississippi River, 45 miles west of Jackson, 235 miles north-west of New Orleans. Its site is elevated and uneven, and the streets are narrow, but regularly laid out. The principal public buildings are a handsome court-house, churches, public and private schools, a commercial college, charity hospital, merchants' and cotton exchange, &c. The chief manufacturing establishments are an extensive cotton-oil mill, iron-foundries, railway-carriage factory, machine-shops, planing-mills, breweries, &c. A considerable trade, chiefly in cotton, lumber, cottonseed-oil and cake, is carried on. Vicksburg stood a protracted siege by the Federal military and naval forces, but capitulated to General Grant with about 27,000 men, 4th July, 1863. Pop. (1890), 13,353.

**VICO**, **GIOVANNI BATTISTA**, Italian jurist and philosopher, was born at Naples in 1668. He was the son of a small bookseller, and was for nine years tutor to the nephews of Rocco, bishop of Ischia. In 1697 he was appointed professor of rhetoric at the University of Naples, and in 1735 historiographer-royal. He was almost unknown to Europe at the time of his death, but a work which he published in 1721, *Principi d'una Scienza Nuova d'intorno alla Commune Natura delle Nazioni*, has caused him to be regarded as one of the founders of the philosophy of history. He was also one of the first to deny the historical reality of the mythical personages which figure in early Greek and Roman history, and anticipated Wolf in his theory of the origin of the Homeric poems. Different opusculi of Vico were collected by Carlo Antonio Rosa, with an autobiography in four vols. (Naples, 1818); and a French edition of his works was published by Michelet

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(1836). There is also a German translation. Vico died at Naples, 20th January, 1744. For an account of his principles see HISTORY. See Flint's Vico (1884).

**VICTOR AMADEUS II.** See **SARDINIAN MONARCHY**.

**VICTOR EMANUEL I.** See **SARDINIAN MONARCHY**.

**VICTOR EMANUEL (VITTORIO EMANUELE) II.**, king of Italy, the eldest son of Charles Albert, king of Sardinia, and of Theresa, daughter of Ferdinand, grand-duke of Tuscany, was born at Turin on 14th March, 1820. He received an excellent training in military science, and in the campaign of 1848-49 against Austria he was commander of a brigade, being severely wounded at Goito. After the battle of Novara, Charles Albert thought that the struggle was hopeless, and abdicated in favour of his son, Victor Emanuel, who thereupon became King of Sardinia, on March 23, 1849. The new king was at first distrusted by the Italian reformers, because he was the husband of an Austrian archduchess, whom he had married in 1842, and a pupil of the Jesuits; but he soon showed himself faithful to the constitution in his negotiations with Austria, and finally received the title of the honest king (*Re galantuomo*). With the aid of wise ministers, among whom was the celebrated Cavour, he regulated the finances, reorganized the army, secularized the church property, gave a stimulus to trade and commerce, and prepared his country to assert its independence in an effort to unite Italy. To further this end, and in order that Sardinia might claim to be a power in European politics, Victor Emanuel sent 17,000 troops to the Crimea (1855) to fight with France and England against Russia. In the Congress of Paris (1856), which followed the Crimean war, Sardinia took part, and her demands that Austria should deal more leniently with the Italian provinces which she occupied was supported by France and England. Cavour also entered into an alliance with Napoleon III. when they met at Plombières, securing France as an ally against Austria when that power invaded Piedmont on the 23rd April, 1859. A number of the Italian states having now declared in favour of Victor Emanuel as their king, he took command of the army, and entered upon a campaign against Austria with Napoleon III. as his ally. At the battle of Palestro he distinguished himself by his bravery, and after a series of engagements, ending with the victory of Magenta, he entered Milan along with Napoleon III. The Austrians were routed, and Lombardy was annexed to Sardinia after the battle of Solferino, when suddenly Napoleon III. closed the war by the treaty of Villafranca (July 11, 1859), which frustrated the hope of making a united Italy. The Italians declared that their cause was betrayed by this treaty, and Cavour was so broken-hearted at the result of all his labours that he retired for some time into Switzerland. This period of gloom soon passed, however, when Tuscany, Modena, Parma, and the Papal Legations declared in favour of Victor Emanuel as their king. This was followed by the conquest and annexation of Sicily by Garibaldi; and as the Sardinian king was now master of the peninsula, with the exception of Rome and Venetia, it was decreed by the senate on the 5th May, 1860, that he should receive the title of King of Italy. It had been a great personal loss to Victor Emanuel when he was required to cede Nice and Savoy, the cradle of his family, to France; but the death of Count Cavour in 1861 was at once a grief to the king and something that seemed, for the time, a national disaster. Yet, although he was deprived of his favourite minister, Victor Emanuel

gave constant attention to the material interests of Italy, so that roads were constructed, the coinage was recast, tithes suppressed, and the ecclesiastical establishments placed under the control of the state. Neither did he slacken his efforts to obtain the complete freedom of Italy from foreign occupation, and in this he was greatly favoured by circumstances. When the conflict arose between Austria and Prussia in 1866, the Italian troops took the field in alliance with the latter power, and although checked at Custozza and Lissa, Victor Emanuel received the cession of Venetia (7th November, 1866) as the result of the Austrian defeat at Sadowa. Rome still remained in the hands of the Papal authorities, supported by France; but when the Franco-German conflict began, in 1870, the French troops were withdrawn, and after the disaster of Sedan, Victor Emanuel advanced upon the city. After negotiations with the pope, and a slight skirmish with the papal troops, the king entered Rome on the 20th September. He took up his residence in the Quirinal, and in the following year the government and parliament installed themselves in the capital. Thenceforward the efforts of the king were mainly directed to the development of Italy and the maintenance of peace through a reconciliation with Austria and an alliance with Germany. His death took place somewhat suddenly on 9th January, 1878. This event produced profound sorrow throughout Italy, for the king was beloved not less for his honest manliness of character than for the benefits which his courage and wisdom had conferred upon his country. See *Storia di Vittorio Emanuele II e del suo Regno* by Cappelletti (three vols., Rome, 1894).

VICTORIA, Queen of the United Kingdom of Great Britain and Ireland and Empress of India, was the only child of Edward, duke of Kent, fourth son of George III., by Mary Louisa Victoria, youngest child of Francis Frederick Antony, duke of Saxe-Coburg-Saalfeld, and widow of Prince Ernest Charles of Leiningen, and was born at Kensington Palace on May 24, 1819. On June 24 she was baptized in the palace by the names of Alexandrina Victoria, the latter name being that of her mother and the former being formed from that of the Czar Alexander I., who was one of the sponsors. The reigning sovereign at the time of her birth was George III., and there stood between her and the throne the Prince Regent, afterwards George IV., the Duke of York, the Duke of Clarence, afterwards William IV., and her father. She was brought up under the careful superintendence of her parents, especially of her mother. Near the close of 1819 she was with her parents at Woolbrook Cottage, Sidmouth, and there, on Jan. 23, 1820, her father died, only nine days after the death of George III. A few months later her mother removed with her to Kensington Palace, where she lived in comparative seclusion till the year of her elevation to queenhood. In the training of the young princess the Duchess of Kent was greatly assisted by the wise advice of her brother, Prince Leopold, afterwards King of the Belgians. Her formal education began in 1824, her first teacher being Fräulein (afterwards Baroness) Lehzen, but from 1827 the chief direction of her studies was intrusted to the Rev. George Davys, afterwards bishop of Peterborough. On the death of George IV. in June 1830 she became heir-presumptive to the throne, and in that year a bill was passed conferring the regency upon the Duchess of Kent in the event of the princess's accession to the crown while still under age, and an additional £10,000 per annum was voted to her on behalf of her daughter. She was confirmed at the Chapel

Royal, St. James's, on July 30, 1835, and in May of the following year she first met her future husband. The death of her uncle, William IV., on June 20, 1837, raised her to the throne, nearly a month after she had attained her majority. She elected to be known by the name of Victoria. The kingdom of Hanover, which, according to the Salic law, could not be ruled by a woman, passed to her uncle, the Duke of Cumberland. The general election of 1837, which took place under the then existing law in consequence of the demise of the crown, resulted in a strengthening of the Tory party, but still left the Whigs under Lord Melbourne in power. The young queen, daughter of a Whig or even Radical father, held Whig principles herself, and soon learned to place implicit confidence in Melbourne and to look to him for political guidance. For many years she was regarded with somewhat unfriendly feelings by the Tories, but her chief favourite among the statesmen with whom she afterwards came into contact was a Tory, or at least a Conservative, Benjamin Disraeli. She opened her first parliament on Nov. 20, 1837, and its first business was the adjustment of her civil list. After some discussion she was granted £385,000 of an annuity, in addition to the revenues of the duchies of Lancaster (ultimately over £60,000 per annum) and Cornwall (ultimately over £66,000), though the latter duchy passed to the Prince of Wales on his birth in 1841. She assumed her father's debts and paid them in full. Her coronation took place in Westminster Abbey on June 28, 1838, amid a scene of great brilliance, among those present being Marshal Soult.

In 1839 the queen came into collision with Peel on the bed-chamber question. Melbourne resigned in May, and Peel was asked to form a ministry, but he insisted on replacing the Whig ladies who held the chief posts in the household by the relatives of Conservative noblemen, and to this the queen emphatically refused her consent. Peel ultimately gained his point, but the immediate result was that Melbourne resumed office. On Oct. 15, 1839, she was engaged to Prince Albert, younger son of the Duke of Saxe-Coburg, who had been carefully trained under the care of King Leopold and his friend Baron Stockmar. An annuity of £30,000 per annum was settled on the prince and a naturalization bill was passed, and on Feb. 10, 1840, the marriage was solemnized in the chapel of St. James's Palace. In July of that year a bill was passed making Prince Albert regent in case the queen should not survive her first confinement, and on Nov. 21 her first child, the Princess Royal, was born at Buckingham Palace. Melbourne was defeated in the House of Commons in 1841 on a vote of no confidence, and parliament was dissolved. The Tories were triumphant at the polls, and Sir Robert Peel, whom she at first distrusted but soon learned to like, became premier. On Nov. 9, 1841, a male heir to the throne, afterwards Edward VII., was born at Buckingham Palace. She made her first visit to Scotland in September, 1842, and in the following year she left Britain for the first time, to visit Louis Philippe at Eu and King Leopold at Brussels. When Peel in 1845 determined on the repeal of the corn-laws the queen gave him her whole-hearted support, and Peel's defeat on an Irish question in 1846 caused her 'deep concern'. Lord John Russell formed a ministry, with Lord Palmerston as foreign secretary, a position in which he gave her much anxiety. In 1848, the year of revolution, she made her first stay at Balmoral, which was afterwards to be her residence during a large part of each year. She had already acquired Osborne, in the Isle of

Wight (1844). She visited Ireland for the first time in 1849, and on that occasion the Cove of Cork, where she landed, was renamed Queenstown in her honour. In 1848 and the three following years her dislike of Palmerston's foreign policy, and her indignation at what she regarded as his arbitrary conduct and high-handed independence, steadily increased, but in December, 1851, his wholly unwarranted approval of the *coup d'état* in France caused Lord John Russell to remove him from office. During the period of the no-popey outcry which followed the re-establishment of Roman Catholic bishoprics in England in 1850, the queen steadily discountenanced Protestant bigotry. The Great Exhibition of 1851, which was mainly due to the initiative and the energy of her husband, naturally aroused her keen interest.

Lord John was defeated on a militia bill in 1852, and Lord Derby formed a new ministry, which included Disraeli as chancellor of the exchequer and leader in the lower House. The result of a general election compelled Derby to resign in December, and upon this, at the queen's own suggestion, Lord Aberdeen formed a coalition ministry which included Palmerston (as home secretary) and Russell. On Feb. 28, 1854, war was declared with Russia, and during the trying time which followed she bore herself with exemplary dignity and showed the keenest interest in the comfort of the troops in the field. Early in 1855 Aberdeen was defeated on the question of the conduct of the war, and the queen was reluctantly compelled to ask Palmerston to form a ministry. The Victoria Cross, for acts of conspicuous bravery in battle, was instituted at her instance in 1856. The year 1857 is memorable as that of the Indian Mutiny, which led to the placing of India more completely under the authority of the crown. In that year also Prince Albert was created Prince Consort by letters-patent, and in the following year Palmerston was succeeded in the premiership by Lord Derby. The Princess Royal was married on Jan. 25, 1858, to the future Frederick III., German Emperor; and on Jan. 27, 1859, their first child and Queen Victoria's first grandchild, the Emperor William II., was born. She interfered with excellent effect in the matter of the proclamation issued to her Indian subjects in 1858, and she created the new order of the Star of India in order to reward native loyalty and eminent services in India. The elections of 1859 placed Derby in a minority and compelled her to accept another Palmerston-Russell ministry. She at once came into conflict with them on the Italian question, on which her sympathies, controlled rather by personal and dynastic than by political considerations, were with Austria. Distrust of the intentions of Napoleon III., which she fully shared, led to the foundation of the volunteer force in 1859, and in 1860 she held a great volunteer review in Hyde Park and formally inaugurated the National Rifle Association at Wimbledon. A special prize for volunteer marksmanship, instituted by her, was known as the Queen's Prize.

On March 16, 1861, her mother died, and on Dec. 14 of the same year she suffered the crowning affliction of her life, the death of her deeply-loved husband. The latter bereavement altered the whole tenour of her life. For many years she lived in almost uninterrupted seclusion, and only towards the very end of her reign did she return to anything like the court system of her married life. The marriage of her eldest son, the Prince of Wales, took place on March 5, 1863, and his first child, afterwards Duke of Clarence, the second heir at that time in the direct line, was born on Jan. 8, 1864.

The war between Prussia and Denmark caused

her keen anxiety, her sympathies on the whole being with Prussia, while the wife of her eldest son was a Danish princess. The death of Palmerston in 1865 raised Lord John (now Earl) Russell to the premiership, and the consequent rearrangement of portfolios made W. E. Gladstone chancellor of the exchequer. The institution of the Albert Medal in 1866 for bravery in rescuing at sea showed at once her devotion to her husband's memory and her quick human sympathy. The war between Prussia and Austria was a severe trial to her, because she had near relatives on both sides, and her satisfaction at the aggrandizement of Prussia was qualified by regret at other results of the war. Earl Russell's defeat on the reform bill led to his resignation in 1866, and a Derby-Disraeli ministry came into power. Disraeli had her active support in carrying his reform bill, which was congenial to her Whig principles. On Derby's resignation in 1868 she had the satisfaction of raising Disraeli to the head of the government, but his defeat on Gladstone's Irish Church resolution led to a dissolution. The electors gave the Liberals a large majority, and in December, 1868, Gladstone became premier and inaugurated a period of reforming energy that filled her with some alarm. With Gladstone she was never in sympathy. Recognizing, however, that Irish disestablishment was inevitable, she used her influence with Archbishop Tait to secure the passage of the bill through the House of Lords. Cardwell's important army reforms were distasteful to her, for she always tried to retain control of the army as a royal prerogative. On Feb. 27, 1872, she attended the service of thanksgiving in St. Paul's Cathedral for the recovery of the Prince of Wales from his dangerous illness.

The dissolution of 1874 placed the Conservatives under Disraeli in power, much to the satisfaction of the queen; and in 1876 the Royal Titles Bill, conferring upon her the additional title of Empress of India, was passed. The passing of this bill may be taken as marking the formal beginning of the movement known as Imperialism, which has come to great prominence in recent years, and with which Queen Victoria was from the first in hearty sympathy. Disraeli was rewarded for his services by being raised to the upper House as Earl of Beaconsfield, and the new *régime* in India was signalized by the institution in 1877 of the Orders of the Indian Empire and the Crown of India. Gladstone's passionate denunciations of Beaconsfield's Eastern policy and of his aggressive imperialism in other parts of the world during the years 1876-79 were extremely distasteful to the queen, and his return to power after the overwhelming Liberal triumph of 1880 was far from welcome to her. In 1878 she had suffered a great grief by the death of her second daughter, the Princess Alice of Hesse, the first of her children to be thus called away.

She disapproved strongly of the action of her ministers in regard to the Transvaal in 1881, and during the Egyptian and Soudan troubles of 1882-85, which culminated in the unhappy fate of the brave Gordon, she never ceased to urge strong action upon her advisers. Gordon's death called forth her keenest sympathy. Beaconsfield's death in 1881 gave her an opportunity of expressing her admiration for one of the leading statesmen of her reign, one whom she had come to regard as a personal friend. The death of her son Prince Leopold, Duke of Albany, in 1884, was naturally a still more severe blow. The negotiations which led to the passing of the franchise and redistribution acts of 1884 and 1885 were much aided by her influence and tact. Gladstone was defeated in June, 1885, and on his resignation was,

in accordance with custom, offered an earldom, which he declined. The Marquis of Salisbury came into office, but in January of the following year, after a general election, through which the Liberals became the more numerous party, she had to recall Gladstone. She was strongly opposed to the Home Rule policy which Gladstone now adopted, and was greatly relieved by its defeat in the Commons and at the polls, and by the return of Salisbury to power (1886). Lord Salisbury, as it turned out, served under her as premier for a longer period than any other of her prime ministers, and their political views were in close harmony.

The completion of the fiftieth year of her reign, in 1887, was celebrated throughout all her dominions with appropriate splendour and rejoicing, and her diamond jubilee in 1897 called forth even more striking demonstrations of loyalty and respect. The queen took an active part in supporting the Colonial and Indian Exhibition of 1886, and in the movement for the foundation of an Imperial Institute in London. In 1889 she felt it necessary to apply to parliament to make provision for the children of the Prince of Wales, and a satisfactory arrangement was come to without much demur, Mr. Gladstone proving a valuable ally in regard to the matter. At the end of 1891 the Duke of Clarence and Avondale, eldest son of the Prince of Wales, was betrothed to Princess Victoria Mary of Teck, but he died early in 1892, before the marriage had taken place. In July of the following year his brother, the Duke of York, married his *fiancée*, and on June 23, 1894, a son, Edward, the third heir to the throne in the direct line, was born to them.

The general election of 1892 placed Gladstone again in power, and once more the queen had to face the question of Home Rule, but she was relieved by the rejection of the 1893 bill in the House of Lords. In 1894 Gladstone resigned, and the queen summoned the Earl of Rosebery to the head of the government. The Liberal Government fell in 1895, and the queen had the satisfaction of again asking Lord Salisbury to form a ministry. Lord Salisbury remained in power during the rest of her reign. On Sept. 23, 1896, her reign exceeded in length that of George III., till then the longest in English history. When Gladstone died in 1898 she expressed sympathy with his family, but she made no pretence of admiration for his public policy and achievements. The South African War, which began in October, 1899, caused her much anxiety and pain, and called forth her former enthusiasm for the army and her old sympathy with suffering. She sent boxes of chocolate to the troops at the front at Christmas, 1899, and in recognition of the bravery of Irish soldiers in the field she conceded the permission to wear the shamrock in the army on St. Patrick's Day, and ordered the formation of a regiment of Irish Guards. She visited Ireland in 1900, after an absence of nearly forty years.

During the last few years of her life she suffered from rheumatics and failing eyesight, and a tendency to aphasia also manifested itself. On Jan. 15, 1901, she drove out for the last time, and from that day she gradually sank till the 22nd, when she peacefully passed away at Osborne at half-past six in the evening in the presence of all her surviving children except her eldest daughter, who was slowly dying in Germany. Her reign of 63 years, 7 months, and 2 days is the longest in English history, and she outlived all previous British sovereigns, being at her death three days older than George III. Her remains rest in a sarcophagus in Frogmore mausoleum, beside those of her husband. During the later years of her life she spent much of her time

abroad and at Balmoral and Osborne, and never remained in London for any length of time. Several attempts were made upon her life at various times, but none of them was of any significance or importance. In 1868 she issued *Leaves from the Journal of our Life in the Highlands*, and in 1883 *More Leaves*—both being very unpretentious little works corresponding with their titles.

By her husband, Albert Francis Charles Augustus Emmanuel of Saxe-Coburg, Prince Consort, she had issue: Victoria Adelaide Maria Louisa, Princess Royal, born Nov. 21, 1840, married Jan. 25, 1858, Frederick, afterwards King of Prussia and German Emperor, died Aug. 5, 1901; Albert Edward, now Edward VII., born Nov. 9, 1841, married March 10, 1863, Princess Alexandra Caroline Marie Charlotte Louisa Julia, eldest daughter of King Christian IX. of Denmark; Alice Maud Mary, born April 25, 1843, married July 1, 1862, the Grand Duke of Hesse, died Dec. 14, 1878; Alfred Ernest, Duke of Edinburgh, born Aug. 6, 1844, married Jan. 23, 1874, the Grand Duchess Marie of Russia, became Duke of Saxe-Coburg on Aug. 22, 1893, died July 30, 1900; Helena Augusta Victoria, born May 25, 1846, married July 5, 1866, Prince Frederick Christian of Schleswig-Holstein; Louise Caroline Alberta, born March 18, 1848, married March 21, 1871, the Marquis of Lorne, now Duke of Argyll; Arthur William Patrick Albert, Duke of Connaught, born May 1, 1850, married March 13, 1879, Princess Louise Margaret Alexandra Victoria Agnes of Prussia; Leopold, Duke of Albany, born April 7, 1853, married April 27, 1882, Princess Helen of Waldeck, died March 28, 1884; Beatrice Mary Victoria Feodore, born April 14, 1857, married July 23, 1885, Prince Henry Maurice of Battenberg. Six of the queen's children survived her, and of the nine all but the Duchess of Argyll have issue. At the time of her death she had thirty-one grandchildren, and of her great-grandchildren there were thirty-seven.

See the notice in the Dictionary of National Biography (Supplement) by Sidney Lee, and the same as published separately in an enlarged form; biographies by Holmes (1887), J. C. Jeaffreson (1893), and others; Mrs. Gurney's *Childhood of Queen Victoria* (1901); Grey's *Early Years of the Prince Consort* (1868), and Martin's *Life of the Prince Consort* (five vols., 1874-80); the Greville Memoirs; the Queen's own little works.

VICTORIA, a British colony, forming one of the original states of the Commonwealth of Australia, in the south-east of the island of Australia, between lat. 34° and 39° s., and lon. 141° and 150° e. It is bounded on the north by New South Wales; on the west by South Australia, the boundary elsewhere being the ocean; Bass Strait on the south separates it from Tasmania; area, 87,884 square miles. The coast, both at the eastern and western extremities, is low and flat, and with few indentations, but in the centre, between Cape Otway and Wilson Promontory, it is broken by large bays and skirted by perpendicular cliffs 500 to 1000 feet in height. Among these natural harbours the most remarkable is Port Phillip Bay, which, with an area of 875 square miles, and an entrance scarcely 2 miles wide, affords a safe shelter for the largest fleet. The entire seaboard, which has a southern aspect, is about 600 geographical miles in extent. The interior, though somewhat diversified by mountains, is chiefly distinguished by vast unwooded plains, so that it has been said the plough might often be drawn continuously for 100 miles across tracts of agricultural land. The land, however, is chiefly occupied as pasture, for which it is best adapted. There are two principal ranges of mountains near

the opposite extremities of the colony. The eastern range, known as the Australian Alps, enters the colony from New South Wales, where it runs south parallel to the coast. On entering Victoria it proceeds south-west, with diminishing height, to the coast at Wilson Promontory. This range has numerous ramifications north and west, covering an area estimated at 7000 square miles. In Mount Bogong it rises to the height of 6508 feet, in Mount Hotham to that of 6100, and there are several other summits over 5000 feet high. The western range, called the Grampians, lies in a direction roughly north and south, including the Sierra range on the east and the western or Victoria range, with their nucleus in Mount William (3827 feet), at the north-west extremity of Ripon county. The Grampians and Australian Alps are distinctly connected by such ranges as the Pyrenees and the Great Dividing Range, and their united system forms a continuous watershed, sending the drainage north to the Murray or south to the ocean. The whole system has an extent east to west of about 300 miles, with breadths varying from 100 to 150 miles, and numerous cones and extinct (apparently submarine) craters, and is composed of metamorphic rocks of granite, syenite, quartz, &c., overlain by secondary and tertiary formations. This is the region of the gold-fields. The rivers are numerous, but seldom large. In the rainy season they overflow their banks, and in summer they dry up and leave the country parched. This is the great climatic disadvantage of Victoria. The most important river is the Murray, which, from its source in the eastern mountains, forms the boundary between Victoria and New South Wales, deriving most of its waters from the latter and skirting the whole colony in a north-western direction, finally flowing through South Australia into Lake Alexandrina. Its length is 1700 miles, and it is navigable for several hundred miles. Another short navigable river is the Yarra-Yarra, on which, at its entrance into Port Phillip Bay, Melbourne, the capital, is situated. Most of the other principal rivers are tributaries of the Murray, except the Snowy, which crosses the east part of the colony. Lakes are numerous, but are small and liable to dry up, and often salt. The climate of Victoria is temperate and salubrious, but liable to sudden fluctuations, and the hot winds from the interior which blow at intervals from November to February cause great discomfort. The annual fall of rain at Melbourne is 27 inches. For the chief animal and vegetable products native to the colony see AUSTRALIA. Some of the common English quadrupeds and birds have been introduced, such as hares, rabbits, deer (foreign as well as English), goats, pheasants, quails, white swans, partridges, ducks, thrushes, larks, &c., and are now becoming quite plentiful. Rabbits have become so numerous in some localities as to prove a nuisance. Victoria has a valuable asset in its forests, now under government management. The chief mineral production is gold, which was discovered in 1851. The gold discoveries were important not only to the colony, but to the world at large, as they made Australia for a time the chief source of supply. (See GOLD.) In 1852 the yield of gold in Victoria was 2,218,782 ozs., valued at £8,875,128; in 1856 the yield was 2,985,991 ozs., value £11,943,964. In 1900 the total yield of gold was 807,407 ozs., of the value of £3,229,628; in 1901 the amount was rather smaller. Copper, tin, antimony, silver, iron, limestone, and coal are also among the minerals worked. The staple product, however, is wool. The cultivation of wool seemed to be threatened by the gold discoveries, but instead of that the value of the wool

exported is now much greater than that of the gold obtained. In 1869 the value of the wool exported was £3,368,075; in more recent years it has sometimes been as high as £6,000,000. The total value of Victorian produce exported in 1868 was £11,697,893; in 1883, £13,292,294; in 1900, £17,422,552. The imports, in 1886 amounted to £18,530,575; in 1900 to £18,301,811. A very large proportion of the trade is direct with Great Britain. Agriculture has not been neglected, and besides wheat, barley, and oats, fruits, and especially the vine, have received attention. Of the four million acres under cultivation, fully two million are under wheat. Victoria promises to become a great wine country. Tobacco is also growing into a staple. Much money has been expended on irrigation and other waterworks.

Victoria is divided into five districts, and these into thirty-seven counties. The districts are Gippsland, Murray, Wimmera, Loddon, and Western. The executive is vested in the governor, who is also commander-in-chief of the colonial troops, and is assisted by a ministry of eleven members. He is appointed by the crown for six years, and has a salary of £7000. The legislative authority is vested in a parliament of two chambers, the legislative council and the legislative assembly. The legislative council at present consists of forty-eight members, representing fourteen provinces, and holding office for six years. The legislative assembly has ninety-five members, representing electoral districts, and is elected triennially. Members are paid £300 a year in reimbursement of their expenses. A property qualification is required both for members and electors of the legislative council; the members of the legislative assembly are elected by universal suffrage. The revenue of Victoria amounted in the year 1900-1901 to the sum of £7,727,163; the expenditure for the same year amounted to about £7,710,000. The chief item of expenditure is railways and public works, and there is a debt, contracted chiefly on account of these, amounting in 1901 to £50,071,047. In the middle of the year 1901 Victoria had 3238 miles of railway opened, all belonging to the government of the state. The principal lines connect the leading towns, Melbourne, Geelong, Ballarat, and Bendigo. There is telegraphic communication with the other Australian states and with England. The government of Victoria is protective, and gives bonuses on manufactures, which have consequently made some progress. The breweries, tanneries, soap and candle works, woollen mills, and meat-preserving establishments may especially be mentioned. There are numerous minor manufactures for the supply of local wants. Among religious sects the Church of England is most largely represented in Victoria, the Roman Catholics next, and the Presbyterians third. Attendance at school is compulsory in Victoria between the ages of 6 and 13, the attendance to amount to 40 days in each quarter-year. In the state schools education is free in certain subjects, and compulsory with certain exceptions. There are several colleges connected with various religious denominations, besides the Melbourne University. The number of technical schools is increasing.

Little was known of this part of Australia at the end of the eighteenth century. In 1802 Port Phillip Bay was explored, and the country and bay were taken possession of for Britain, the name being given in honour of Captain Phillip, governor of New South Wales. A convict settlement was planted next year at Port Phillip, but was transferred to Tasmania (then called Van Diemen's Land) in a few months. Victoria was first colonized



in 1834 and 1835 from Tasmania, after one or two other unsuccessful attempts from other quarters. It now made rapid progress, especially in breeding sheep, of which in ten years it had 1,500,000. The population in 1846 amounted to 32,879. Melbourne had already become a municipality; in 1847 it was made a city, and the first bishop arrived early next year. By 1850 the population numbered over 76,000. But the turning-point in its fortunes was the discovery of gold, which caused a rush of population from all parts. Hitherto it had been known as Port Phillip, and formed part of the colony of New South Wales, but it was now erected into a separate colony under the name of Victoria. The present system of responsible government was introduced in 1856, and in that year also the first line of railway (Melbourne to Sandridge) was opened. Ballot voting dates from 1856, and in 1857 manhood suffrage became the basis of election for the lower house. A great international exhibition was held in Melbourne in 1880-81, and a second took place in 1888-89. The colony suffered much during the commercial depression of the early nineties of last century, when several banks suspended payment. In recent years financial problems have been prominent, and retrenchment has been a burning issue. The Act establishing free, secular, and compulsory education was passed in 1873. An income-tax law came into force in 1895. A very advanced Factories and Shops Act was passed in 1896, and an additional one followed in 1900. These provide for the fixing of minimum rates of wages. In 1901 Victoria became a state of the Commonwealth of Australia. It returns six members to the federal senate and twenty-three members to the federal house of representatives. Pop. in 1871, 731,528; in 1881, 862,346; in 1891, 1,140,405; in 1901, 1,201,506.

**VICTORIA**, a town of Southern Rhodesia, the centre of an auriferous district, 188 miles due south of Salisbury. It has the usual government buildings and a hospital, and is protected by a fort. The climate is unhealthy during the rainy season. About 17 miles to the east are the famous Zimbabwe ruins, the relics of a very ancient exploitation of the gold in the territory. (See ZIMBABWE.) Pop. about 25,000 natives and 100 whites.

**VICTORIA**, a town and seaport of Brazil, capital of the state of Espirito Santo, situated on the bay of Espirito Santo, 275 miles north-east by east of Rio de Janeiro. The roadstead is well sheltered and the best between Bahia and Rio. The entrance to the bay is defended by five batteries, and several islets and rocks make it difficult of passage. The town is regularly built, and has fine streets and some striking buildings. An old Jesuit college, founded in 1551, is now used as the government palace. Victoria comes next to Santos and Rio as a coffee-exporting port. It is one of the oldest Portuguese establishments in Brazil, and succeeded the town of Espirito Santo, which was founded in 1535 a short distance to the E.S.E., and was soon afterwards transferred to a neighbouring island. Pop. about 10,000.

**VICTORIA**, a town in Vancouver Island, capital of British Columbia, on the Strait of Juan de Fuca, at the south-east end of the island, amid beautiful scenery. There are government buildings, town-hall, Anglican cathedral, &c., and some good streets and many well-built houses. The harbour of Victoria for large vessels is at Esquimalt, 3 miles distant, where there is a station of the British navy, and to which runs an electric railway. There is also a railway to the coal-mining town Nanaimo (73 miles). Pop. (1891), 16,841; (1901), 20,816.

**VICTORIA**. See HONG-KONG.

**VICTORIA CROSS**, a British military decoration instituted at the close of the Crimean war in 1856. It is granted to soldiers, sailors, or marines of any rank for having performed some signal act of devotion in the presence of the enemy. It consists of a bronze Maltese cross, with a royal crown in the centre, surmounted by a lion, and the words 'For Valour' on a scroll below the crown. The ribbon is red for the army and blue for the navy. A pension of £10 a year accompanies the decoration when gained by a non-commissioned officer, private, &c., with additional clasp and £5 if gained a second time.

**VICTORIA REGIA**, the name given to a magnificent water-lily, observed in the river Berbice, in British Guiana, in 1837, by Sir Robert Schomburgk, and belonging to the natural order Nymphæaceæ. The leaves measure from 6 to 10 or 12 feet across; they are orbicular or peltate in shape, with a rim 3 or 4 inches high, the upper surface of a deep green, the lower of a crimson tint, furnished with strong veins, which are cellular, filled with air, and form an elegant net-work. These enormous leaves can support a great weight as they rest on the water, and a child of twelve may thus be borne up, if standing on a small board. The flower when expanded is nearly a foot in diameter; the petals are numerous and at first pure white, passing by successive tints into a rosy hue and a lively red, and they exhale an agreeable odour. The plant is successfully cultivated in hothouses.

**VICTORIA UNIVERSITY**. See OWENS COLLEGE.

**VICUNA**. See LLAMA.

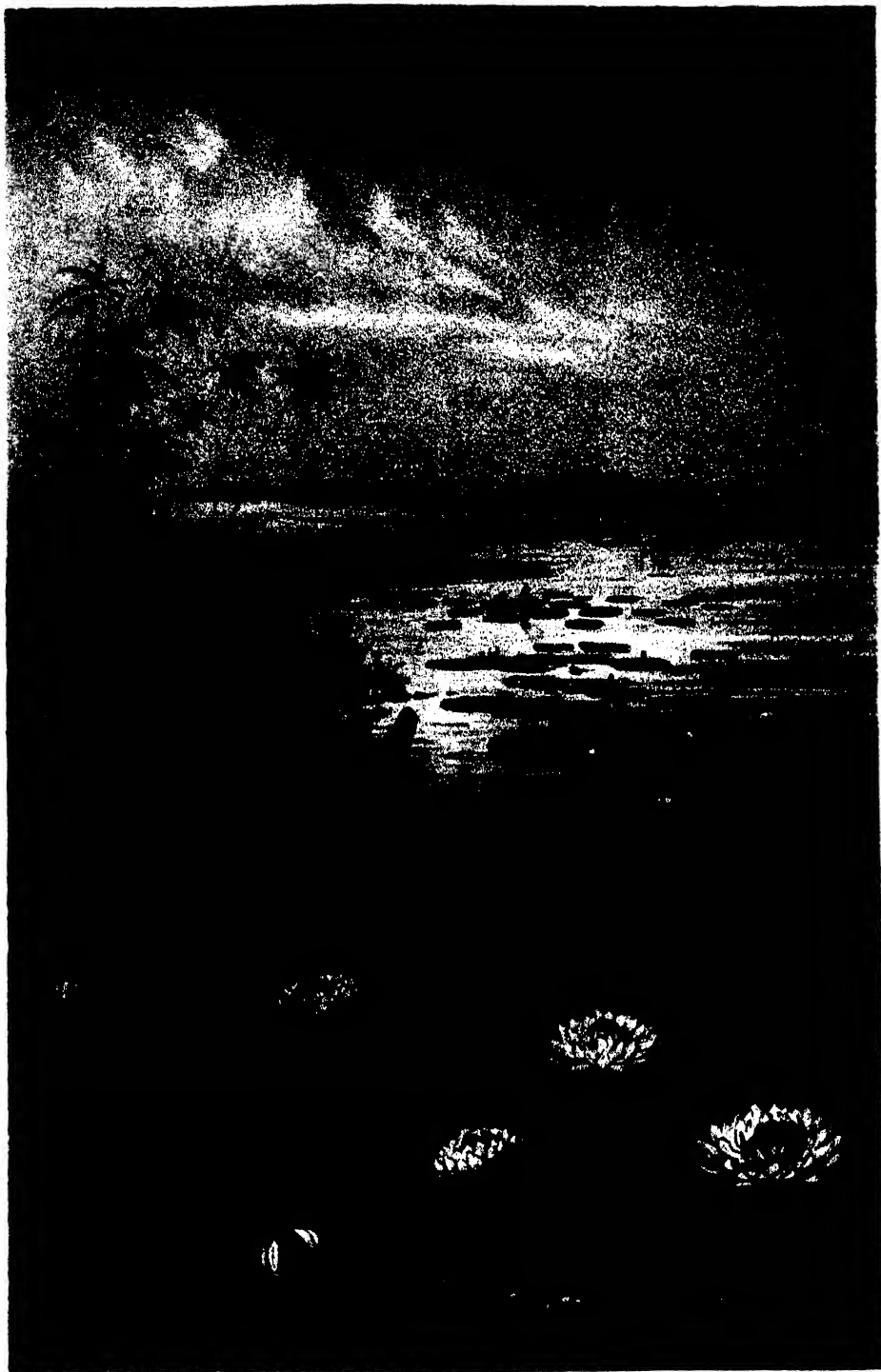
**VIENNA** (Latin, *Vindobona*; German, *Wien*), one of the great cities of Europe, capital of the Austro-Hungarian Empire, on the right bank of the Danube and on the Donaukanal, a narrow arm of the river, into which fall several small streams. It is 380 miles S.S.E. of Berlin, and 650 miles east by south of Paris, and stands in a plain with conspicuous mountain boundaries at 10 or 12 miles distance on all sides. Most of the city is on the right bank of the Donaukanal, rising from it with a considerable acclivity. The older portion was separated from the newer by a wall and ditch, forming what is called the 'Lines', but this has largely given place to an encircling street or boulevard. The nucleus of the city, the Innere Stadt, forms a small part of the whole inside the Lines. It was formerly surrounded by a rampart, fosse, and glacis, but these have been levelled, and the space occupied by the Ringstrasse, a handsome boulevard averaging 55 yards broad, forming one of the finest thoroughfares in Europe. The inner or old town is still the court and fashionable quarter of the city, and contains some of the finest mansions of the nobility. The streets here are often narrow and crooked; but on the whole Vienna is a handsome well-built town, with fine squares, and straight and spacious streets well kept. The houses are frequently built four or five stories high, and occupied in flats with common stairs. The chief public park is the Prater, on the island between the Donaukanal and the river itself, about 4 miles long and 2 broad, and so beautifully laid out, planted, and decorated, that it is regarded as the finest public park in Europe. Among the churches the most remarkable is the Dom Kirche, or cathedral of St. Stephen, a lofty cruciform Gothic structure, with a main tower (erected in 1860-64 to replace a former unstable structure), tapering with regularly retreating arches and buttresses to a height of 453 feet. The tower contains a bell of 18 tons weight, made of cannon taken from the Turks. The richly groined roof is supported by eighteen massive sculptured pillars, and the interior is adorned with numerous







# VICTORIA REGIA.



VICTORIA REGIA GROWING IN THE RIVER AMAZON.



statues and monuments, and a superb pulpit. The windows present fine specimens of ancient painted glass. The Hofpfarrkirche (1830) is a finely-proportioned edifice; the Capuchin church contains the imperial burying vault; the Votivkirche (1856-79) is one of the finest specimens of modern Gothic. The imperial palace, or Hofburg, on the south-west of the inner town, is a conglomeration of parts of various dates, with a fine new façade constructed in 1890-98; the imperial summer residence, Schönbrunn, with fine grounds, is in the suburb of Hietzing. The palace of the Archduke Albert adjoining the imperial palace is modern and handsome, as are those of the Archdukes Victor and William. The palace of the Prince of Liechtenstein, those of Duke Philip Alexander of Württemberg, Prince Augustus of Saxe-Coburg-Gotha, and others of the nobility are also noticeable. Specially must be mentioned the Parlaments-palast, in which the legislature met for the first time in November, 1883; the magnificent Gothic Rathaus (1872-83), the courts of justice, the twin museums of art and of natural history, the mint, the imperial and civil arsenals, the barracks, the exchange, and the national bank. The university was founded in 1237, and reorganized by Maria Theresa. It occupies a fine new building, and has over 350 professors and instructors, and an attendance of about 6000. There is in immediate connection with it an admirable botanic garden and several valuable collections. The Josephinum, an academy for army surgeons, has an extensive series of anatomical preparations in wax. The Polytechnic Institute instructs about 900 pupils in engineering and other practical arts. The Seminarium, a Roman Catholic institute, is devoted to the special training of priests; there are also Hungarian and Protestant theological institutes. An academy of oriental languages, a military academy, an academy of the fine arts, a conservatory of music, and a number of gymnasia and real schools are among the leading educational appliances of the metropolis. There are many libraries and museums open to the public. The chief among the former are the imperial library with 500,000 volumes and 20,000 MSS., and the university library with 320,000 volumes. The imperial museum of natural history is one of the finest in Europe. The imperial cabinet of coins and antiquities contains 140,000 coins and medals, 12,000 Greek vases, fine cameos and intaglios, and other treasures. The Treasury, among other imperial treasures, contains the regalia of Charlemagne, taken out of his grave at Aix-la-Chapelle. The imperial picture-gallery contains about 2000 pictures. The Academy of Arts has also a gallery, and there are a number of well-known private collections. Charitable, sanatory, and other institutions are numerous. There is a general hospital with 3000 beds, a general lying-in and foundling hospital, and other benevolent institutions too numerous to mention. The Academy of Sciences, the Austrian Geological Institute, the Imperial Geographical Society, the Polytechnic Institute, the Imperial Agricultural Society, and the Austrian Philharmonic Society, are the principal of such associations. Gardens, cafés, and similar places of amusement are numerous. The principal theatres are the Hofburg and the Stadt theatres, the fine Opera house, &c. Vienna is the first manufacturing town in the empire. Its manufactures include cotton and silk goods, leather, porcelain, arms, musical instruments, hardware, and numerous other articles. There is also a large inland trade.

Vienna appears to have been a Roman station in the first century. It was afterwards included in Upper Pannonia, and received the name of Vindobona. It was taken and pillaged by Attila about 450. It was conquered by Charlemagne about 791, became

the capital of the Margraviate of Austria about 1142, a free imperial city in 1237; it was besieged by Solymán in 1529, and by Kara Mustapha in 1683, was occupied by Napoleon, 13th November, 1805, and 12th May, 1809; the old walls were demolished in 1860. It is now the centre of a great railway system which promises further development of its resources; and the diversion and deepening of the channel of the Danube (completed partially, 1881), which brings the river nearer the city, is expected to make it the centre of the shipping trade between eastern and western Europe. In 1873 a great international exhibition was opened in the Prater. In 1890 many suburbs were incorporated with the city, which is now divided into nineteen districts. Pop. in 1880, 726,105; in 1890, 1,364,548; in 1900, 1,662,289.

VIENNA, CONGRESS OF. This congress was assembled after the first overthrow of Napoleon to reorganize the political system of Europe, disturbed by the conquests of France. The congress assembled on 1st November, 1814. The principal powers represented in it were Austria, Russia, Prussia, England, and France. Spain, Portugal, Sweden, and other minor powers were also consulted on matters more nearly concerning them. The Emperors of Austria and Russia, the King of Prussia, and many other German princes were present in person. The leading territorial adjustments effected by the congress were the following:—Austria recovered Lombardy and Venetia, while Tuscany and Modena were conferred on collateral branches of the imperial house. The Infanta Maria Louisa, queen of Etruria, received the Duchy of Lucca in exchange for Parma, Piacenza, and Guastalla, which were given with the title of empress to Maria Louisa, ex-empress of France. The Legations, Benevento, and Ponte Corvo were restored to the pope. The King of Sardinia recovered Piedmont and Savoy, with the addition of Genoa. Murat retained Naples. Holland and Belgium were erected into a kingdom for the Prince of Orange, William I. Hanover, with the title of king, returned to the King of England, and the Ionian Isles were as a republic placed under the protectorate of Great Britain, which also retained Malta, Heligoland, and several conquered colonies. A federative constitution, with a diet at Frankfurt, was established for Germany. The Kings of Denmark and the Netherlands were admitted in virtue of their German possessions to the diet. Bavaria was reinstated in her Palatine possessions with Würzburg, Aschaffenburg, and Rhenish Bavaria, in return for her restorations to Austria. The demands of Prussia caused a dispute which nearly broke up the congress, but she was finally satisfied with the Duchy of Posen, the Rhine Province, and a part of Saxony. The congress was suddenly broken up by the restoration of Napoleon; but its acts were signed by the powers interested on 9th June, 1815. See also the notices of the different countries represented in it.

VIENNE, a department of France, bounded north by Maine-et-Loire and Indre-et-Loire, east by Indre, south by Haute-Vienne and Charente, and west by Deux-Sèvres; area, 2690 square miles. The surface, though nowhere mountainous, is very much diversified. It is well watered, being traversed south to north by the Vienne, and on its north frontier by the Creuse, both navigable, and belonging to the basin of the Loire; has a mild though changeable climate, and is generally healthy. Three-fifths of the surface is arable. The wine produced in the department is indifferent. Iron is abundant, and there are excellent quarries of marble, granite, millstones, whetstones, lithographic stones, and limestone. The manufactures consist of woollens, lace, cutlery,

saddlery, &c. There are also numerous bleachfields, paper-mills, blast-furnaces, and other iron-works. The capital is Poitiers. Pop. in (1901), 333,896.

**VIENNE** (anc. *Vienne Allobrogum*), a town of France, in the department of Isère, at the foot of an amphitheatre of hills, on the left bank of the Rhone, here crossed by a suspension-bridge leading to the suburb of St. Colombe, 49 miles N.W. of Grenoble. It is a very ancient place, and very indifferently built, having only a few small squares, and narrow, dark, steep, and winding streets. The principal edifices are the cathedral, with a west front flanked by two towers; the church and cloister of the ancient abbey of St. André-le-Bas, with a fine Romanesque tower; the museum, the public library, the college, the infirmary, hospital, and corn-market. The manufactures are woollens, linens, soap, and chemicals. There are also silk-mills, dye-works, tanneries, glass-works, paper-mills, copper and lead foundries, iron-mills, and blast-furnaces. The trade is important. Vienne contains numerous Roman remains. It is one of the first towns of France into which Christianity was introduced, and makes a considerable figure in ecclesiastical history. Pop. (1896), 24,977.

**VIENNE, HAUTE**, a department of France, bounded north by Vienne and Indre, east by Creuse, south by Corrèze and Dordogne, and west by Charente; area, 2130 square miles. The surface is covered by numerous hills and mountains, which are highest in the east and slope gradually to the west, and exhibit extensive forests. The culminating point, Mont Jargean, 3116 feet, separates the basin of the Loire, to which almost the whole department belongs, from those of the Charente and Dordogne. The principal river is the Vienne. Little of the soil being adapted for wheat, the principal crops are buckwheat, rye, beans, and pease. Horses, mules, and swine of superior breeds are reared. The minerals include iron, copper, tin, lead, antimony, coal, and an excellent seam of kaolin, which is largely employed in the porcelain-works in the neighbourhood of Paris. The principal manufactures are porcelain, woollen and other tissues, paper, and leather. There are also many glass-works, blast-furnaces, steel and other iron works. Limoges is the capital. Pop. in 1896, 366,972; in 1901, 374,212.

**VIERWALDSTÄTTERSEE**. See **LUZERNE** (LAKE OF).

**VIGIL** (Latin, *vigil*, watchful), an ecclesiastical term applied at first to the evening, and afterwards to the whole day, preceding a great festival. This name originated from the circumstance that the first Christians spent a part of the night preceding such festivals in prayer, to prepare themselves for the coming celebration.

**VIGO**, a city and sea-port of Spain, in Galicia, in the province of Pontevedra, on a spacious bay. It is surrounded by walls with bastions, and has steep, narrow, and tortuous streets. Agriculture, fishing, and curing sardines form the principal employment of the inhabitants, and the trade is in wine, grain, oil, and fish. Pop. (1887), 15,044.

**VIKING** (from the Icelandic *vík*, a bay or fiord, and the termination *ing*, implying one who belongs to or is descended from: literally one who lurked in bays and issued thence to plunder), a rover or sea-robber belonging to one of the bands of Northmen who scoured the European seas during the eighth, ninth, and tenth centuries. This word has been frequently confounded with *sea-king*, a term which is applied to a man of royal race, who took by right the title of king when he assumed the command of men, although only of a ship's crew; whereas the former term is applicable to any member of the rover bands. See **NORTHMEN**.

**VILLARS, CLAUDE LOUIS HECTOR, DUC DE**, one of the greatest generals of the age of Louis XIV., was the son of Lieutenant-general the Marquis de Villars, and was born at Moulins, 8th May, 1653. He early entered the army, and greatly distinguished himself under such commanders as Turenne, Condé, and Luxembourg. He was appointed *maréchal de camp* in 1690, and Lieutenant-general in 1693. In the war of the Spanish Succession (see **SUCCESSION WARS**) he obtained for the first time an independent command, being sent to co-operate with the Elector of Bavaria. He defeated Prince Louis of Baden at Friedlingen, 14th October, 1702, for which he received his marshal's baton; and having formed a junction with the elector he defeated the Prince of Baden at Höchstädt, 21st September, 1703. In 1704 he was employed in suppressing the insurrection of the Camisards (see **CAMISARDS** and **CAVALIER**); and for his brilliant success he was created duke the following year. After the battle of Blenheim he was sent with the army of the Moselle to defend the frontier against Marlborough. He selected a position at Fronsberg (1705), in which Marlborough did not venture to attack him. In 1705, 1706, and 1707 he took the offensive with success against the Imperialists, forced the formidable lines of Stollhofen, near Strasburg, and penetrated far into Germany. After recrossing the Rhine he was recalled (1708) to defend the southern frontier against the Duke of Savoy. While making head in this quarter he was recalled by the defeat of Oudenarde to replace Vendôme in Flanders (1709). To save Mons he fought the battle of Malplaquet against Marlborough and Eugene, in which he was seriously wounded. In 1712 he defeated the allies at Denain, took Marchiennes, and forced Eugene to raise the siege of Landrecy. After the Peace of Utrecht he opposed Eugene with uninterrupted success in the closing campaign of the war, and negotiated with him the Peace of Rastadt, 7th March, 1714. When war broke out anew between France and Austria in 1733 he was sent to Italy at the head of an army, with the title of Marshal-general of France. After a successful campaign, in which he displayed all his wonted vigour, he demanded his recall, being thwarted in his operations by the King of Sardinia; but the fatigues of war at an advanced age had exhausted his constitution, and he died at Turin, 17th June, 1734.

**VILLEINS**, a species of serfs who grew up along with the feudal customs of Europe. A feudal lord received from his superior, on condition of military service, a grant of conquered land, which he distributed among his dependents on two distinct tenures or classes of tenure. The freemen, who were the kindred or followers of the conqueror, received their land on the same condition of military service as himself. The conquered or the serfs who were not directly employed in domestic or personal service were allowed to cultivate the land on the tenure of menial or non-military services, either determinate or indeterminate. Such is the simple origin of villenage. In some cases the villeins were at the absolute disposal of their lord, who could sell them or deal with them as he pleased. In others they were attached to the soil, and formed part of its movable wealth. Sometimes they held by defined services, such as making and repairing roads, felling timber, or cultivating the lord's domain; but even then the control of justice was commonly in the hands of their lord, against whose oppression they had no redress. Hallam says that in England they were incapable of property; yet even in England, when the laws began to extend their protection to personal rights, the association of the villeins with

the soil established a good tenure of property, subject to customary services, which were finally commuted into money rents. See COPYHOLD, LAND (TENURE OF), MANOR, &c.

VILLIERS. See BUCKINGHAM and CLARENDON.

VILLIERS, CHARLES PELHAM, statesman, grandson of Thomas Villiers, first Earl of Clarendon, was born in London on Jan. 3, 1802. After attending a Kensington school and the East India College at Haileybury he entered St. John's College, Cambridge, as a gentleman commoner, and graduated B.A. in 1824. Going to London, he came into contact with Stuart Mill, Grote, and the other utilitarian leaders, and he unsuccessfully contested Hull as a parliamentary candidate in 1826. In 1827 he was called to the bar at Lincoln's Inn, three years later he became secretary to the master of the rolls, and in 1833 he was appointed an examiner of witnesses in the court of chancery. He was elected member for Wolverhampton in 1835, and he represented that constituency uninterruptedly for the remaining sixty-three years of his life. Soon after entering the House of Commons he began to press for repeal of the corn-laws, and when the Anti-Corn-Law League was founded he urged his case more vigorously. He secured the appointment of a select committee on the subject in 1840, whose report greatly strengthened the free-trade cause. His annual motions for repeal were regularly defeated by large majorities, but his object was achieved when Peel joined the free-traders in 1846. He was appointed judge-advocate-general in 1852, and in 1859 he became president of the poor-law board and a cabinet minister under Palmerston. He resigned office on a pension in 1866. He died in London on Jan. 16, 1898, at the great age of ninety-six. A selection of his speeches on free-trade was published in 1883 in two volumes.

VILLON, FRANÇOIS, French poet, was born in 1431, probably at Paris. His real name was François de Montcorbier, but he adopted the name of his guardian, Guillaume de Villon, a priest. He received the degree of master of arts in 1452, and three years later had to flee the country because he had killed a priest. He was pardoned in 1456 when it had become clear that the deed was done in self-defence, but immediately afterwards he engaged in a series of extensive robberies, for which he was condemned to death. While lying in prison awaiting the execution of his sentence he wrote the epitaph in which he depicts himself and his companions suspended on the gibbet. His sentence, was, however, commuted to banishment, but in 1461 he was again in prison, this time at Meung, perhaps for sacrilege. He was set free in October of that year in consequence of a jail delivery ordered by Louis XI. on the occasion of his visit to the town. Nothing is known of his subsequent career, but probably he died soon afterwards, worn out by dissipation, torture, and imprisonment. His works include *Le Petit Testament* (1456); *Le Grand Testament* (about 1461); and numerous ballads. The first dated edition of his works is that of 1489, and of recent editions the best are those of Longnon (1892) and Moland (1893). There is an English translation of much of his best work by Mr. John Payne (new edition, 1892). See Longnon's *Étude Biographique* (1878); and R. L. Stevenson's *Familiar Studies* (1888).

VILNA, or WILNA, a town of Russia, capital of the government of the same name, on the Vilia, 415 miles south-west of St. Petersburg. It is picturesquely situated, partly on hills, partly on the banks of the river, and contains numerous convents and churches. The most notable buildings are the

governor's palace, the town-house, and the buildings of the now suppressed university. The Greek and the Roman Catholic cathedrals are also worthy of notice. Educational institutions are numerous. The manufactures include tobacco, lead pencils, hats, leather, &c. Pop. (1897), 159,568.—The government, which lies on the Baltic, has an area of 16,406 square miles and a population (1897) of 1,591,912.

VIMEIRO, a village of Portuguese Estremadura, 3 miles from Torres Vedras and 28 north-west of Lisbon. It is remarkable for the battle between Wellington and Junot, fought on the 21st of August, 1808, which was followed by the Convention of Cintra (August 30).

VINCENNES, a town of France, department of the Seine, on the east of Paris, just outside the walls and close to the Bois-de-Vincennes. Its large old castle, which is surrounded by lofty walls and deep ditches, was once the frequent residence of the French kings, and was long a state prison. It now forms part of the defences of Paris. The donjon or keep is a square tower 170 feet high with walls 10 feet thick. There is a fine Gothic chapel belonging to the castle. The Bois-de-Vincennes is a beautiful and extensive public park which contains an exercise-ground for infantry, and an area set apart for artillery purposes. The castle was occupied by the insurgent communists in 1871, and surrendered to the Versailles troops on 28th May. Pop. (1901), 30,336.

VINCENT, JOHN JERVIS, EARL OF ST., British admiral, son of a barrister, was born at Meaford, Staffordshire, on Jan. 9, 1735. Educated at Burton-on-Trent and Greenwich, he entered the navy early in 1749, and was promoted to the rank of lieutenant in 1755. He had an important part in the Quebec expedition of 1759, and in 1762 he fought a successful engagement with a French squadron which was proceeding to Newfoundland. He was in command of the *Foudroyant* under Admiral Keppel in the naval battle off Ushant in 1778, and gave evidence in favour of Keppel at the subsequent court-martial. He assisted in relieving Gibraltar in 1780 and again in 1781, and in 1782 he captured the French 74-gun warship *Pégase* after a severe fight. His success gained him a knighthood. In 1783 he was elected to the House of Commons as member for Launceston, and in 1784 for Yarmouth. He attained the rank of rear-admiral in 1787, and that of vice-admiral in 1793. He arrived in the West Indies early in 1794, and in co-operation with Sir Charles Grey captured Martinique, St. Lucia, and Guadeloupe, but the two last were soon recaptured, and Jervis was relieved and returned to England in 1795. Raised to the rank of admiral, he was appointed commander-in-chief in the Mediterranean, in which he was stationed for a time. Towards the end of 1796 he had to withdraw from the Mediterranean owing to the strength of the French and Spanish in that region; but on Feb. 14, 1797, he gained a brilliant victory over a Spanish fleet superior in numbers off Cape St. Vincent. To this victory young Nelson, in command of the *Captain*, contributed materially. Jervis was at once awarded the thanks of parliament, a pension of £3000 a year, the freedom of London and other towns, and the earldom of St. Vincent. He then blockaded Cadiz, but ill-health compelled him to resign his command on June 15, 1799. During the operations after his great victory St. Vincent enforced extremely strict discipline in order to suppress the disaffection which was threatening to spread throughout the whole fleet, and while in command of the Channel fleet in 1800 he enforced the same severe system. In 1801 he became first lord of the admiralty, and he obtained the appoint-



ment of a royal commission in 1802 which laid bare an almost incredible amount of dishonesty in the naval administration. His conduct of admiralty affairs gained him many enemies who made serious charges against him even after he left office in 1804, but in 1806 the House formally voted its approval of his administration. He again took a command in 1806-1807, and in 1821 he was created admiral of the fleet. He died on March 14, 1823. See the *Memoirs* by J. S. Tucker (1844).

VINCENT, *Str.*, one of the British West India Islands, belonging to the Windward Group, 100 miles west of Barbados; 17 miles long and about 10 miles broad; area, 132 square miles. A ridge of high volcanic hills, bold and abrupt, but well wooded, stretches through the island north to south, and sends off subordinate masses, which extend to the sea, and are intersected by beautiful and fertile valleys. The highest peak of the range is *Morne à Garou*, which attains an elevation of about 4000 feet. In the north-west, where the mountains are highest, is a volcano called the *Soufrière*. Its height is 3000 feet above sea-level, and one of its two craters, nearly 2 miles in circuit and 500 feet deep, is occupied by a lake. It was in violent eruption in 1812, and in 1902 eruptions caused great loss of life and immense damage to property. The soil in the valleys is usually a rich, tenacious, and occasionally a fine black loam. On the higher regions it is more sandy and less productive. The climate is exceedingly humid, there being an average annual fall of rain of nearly 80 inches, but it is not unhealthy. The island has on several occasions been visited by violent hurricanes, the most recent being that of 1898. The principal products are sugar, rum, molasses, arrow-root, cocoa, fruits, and cotton, but the sugar industry is in a state of great depression. The fisheries are of some local importance. During the three years 1898-1900 the annual value of imports averaged about £100,000, and of exports £80,000. The government is vested in an administrator subordinate to the governor of the Windward Islands. The revenue averages about £30,000, and the expenditure about £37,000 per annum. The capital is *Kingstown* (pop. 4547). *St. Vincent* was discovered by Columbus in 1498, and has been in British possession uninterruptedly since 1783. Pop. of island (1891), 41,054, namely, 2445 white, 7554 coloured, and 31,055 black.

VINCENT DE PAUL, *St.* See PAUL (*St. Vincent de*).

VINCI, LEONARDO (or LIONARDO) DA, a celebrated Italian painter, sculptor, architect, civil and military engineer, and pioneer in the study of natural and experimental science, a man of almost universal genius and unquestionably one of the most gifted individuals of any age or race. He was born in 1452 at Vinci, a village near Empoli in the valley of the Arno. His father was a lawyer, and his mother was a peasant woman. Leonardo was born out of wedlock, and his parents had no further communication after his birth. Leonardo was brought up in his father's house and early manifested unusual promise. His father placed him with Andrea del Verrocchio, an artist of considerable power and skill, whose chief work is the magnificent equestrian statue of Bartolommeo Colleoni at Venice, and young Leonardo rapidly attained to technical maturity. Vasari ascribes to Leonardo a figure in Verrocchio's picture of The Baptism of Christ now in the Academy at Florence, and probably other parts of this painting were also from the young artist's brush. In 1472 we find his name on the list of the painters' guild at Florence, but he appears to have been regarded as Verrocchio's pupil till about 1477.

He received his first independent commission from the signory of Florence in 1478, and he worked there under Lorenzo the Magnificent till 1480. Only two authentic works of this early period of his career are extant, namely, *The Adoration of the Kings*, in the Uffizi Gallery at Florence, and the *St. Jerome*, in the Vatican Gallery at Rome, both unfinished. During the period 1480-84 he held the appointment of engineer to the sultan of Babylon, that is, Cairo, and travelled widely in Egypt, Cyprus, Asia Minor, Armenia, and neighbouring regions. About 1485 he settled in Milan in the service of Ludovico Sforza. A letter is extant in which Leonardo states his qualifications to the duke, undertaking to carry out not only works of military and civil engineering, but also works in architecture, painting, and sculpture. He was fully employed in Milan in many different ways. He constructed irrigation works, invented many new types of military engines, and even took part in campaigns, acted as director of court pageants and festivities, and completed his two greatest works of art. Of these latter, the celebrated colossal equestrian statue in bronze of Francesco Sforza is known only by the studies for it preserved in the Royal Library at Windsor. The other masterpiece of Leonardo is the celebrated picture of the *Last Supper*, which ranks with Michelangelo's *Last Judgment* and Raphael's *Sistine Madonna* as one of the three greatest pictures of the world. It was painted on the wall of the refectory in the monastery of Santa Maria della Grazie, and was completed about 1498 after some ten years' work. Leonardo employed a method, devised by himself, of painting on the wall in oil, but unfortunately the picture soon began to fade. It has been repeatedly restored, and thus it is probable that in its present form, though preserving the well-balanced and carefully-conceived design of the painter, it retains nothing of his actual execution. In engravings, notably that of Raphael Morghen, and numerous copies, it is perhaps the best known of all pictures. It portrays the varied emotions and expressions of the twelve just after Jesus has told them that one of them will betray him. At Milan, Leonardo was head of an academy of arts, and trained or influenced numerous painters, such as Bernardino Luini, Beltraccio, and his close friend Salaino. He also extended his investigations in mathematics, mechanics, and other sciences, and contributed the figures to the *De Divina Proportione* of his mathematical friend Pacioli. Duke Ludovico gave him a present of a vineyard near Milan in 1499, but on his patron's fall next year he left Milan and appears to have gone to Venice. In 1501 he was again in Florence, and in 1502 he entered the service of Cesar Borgia as military engineer, and travelled with him through much of Central Italy. He settled once more in Florence in 1503 and produced fresh paintings of great power. A black chalk cartoon for an altar-piece for Santa Maria dell' Annunziata is one of the treasures of the Royal Academy in London. His portrait of Mona Lisa, wife of Zanobi del Giocondo, which was purchased by Francis I., and is now in the Louvre gallery (being commonly called *La Gioconda*), is a masterpiece. He and Michelangelo were both commissioned in 1503 to decorate the walls of the great hall of the palace of the signory, now Palazzo Vecchio, at Florence. Each prepared a cartoon of a battle-subject, that of Da Vinci representing a furious fight for a standard in the battle of Anghiari, in which the Florentines overcame the Milanese. Both the cartoons, when exhibited, were admired as triumphs of the painter's art, but they have unfortunately both perished. Leonardo started to transfer his subject to the walls, but a new process,

invented by himself, failed even more signally than that used at Milan, and he abandoned the work in disgust. From extant engravings we can form some conception of this great attempt. His failure with this picture and disputes with his half-brothers about his inheritance led to his departure in 1506 for Milan, then in French possession. He became court painter and engineer to Louis XII., and about this time painted his Virgin of the Rocks, of which there are two existing forms, one in the Louvre and the other and much better one in the National Gallery at London. In 1514 he went to Rome, where the pope was Leo X., son of his former patron Lorenzo de' Medici, but he was not well received at the papal court, and in 1515 he returned to Milan, where Francis I. was now in authority. Francis induced him to go to France, and assigned for his use the Château de Cloux, near Amboise, where accordingly Leonardo and his friend Francesco Melzi took up their abode in 1516. His career was now drawing to its close, and on May 2, 1519, he passed away.

Leonardo was the oldest of the three great masters of the Italian Renaissance—Da Vinci, Michelangelo, Raphael—and the most brilliant and many-sided representative of a brilliant and many-sided age. The extent of his existing work is small, but the extraordinary greatness of his genius is as indisputable as the marvellous range of his powers. Standing in the front rank of painting and sculpture in his time, he was also one of its foremost engineers, and his works show that his mind was as thoroughly scientific as it was grandly artistic. He anticipated many of the ideas and principles slowly evolved by science since his day, and he had a wonderful acquaintance with the facts of anatomy, physiology, botany, geology, and other similar branches of knowledge. In painting, his greatness is chiefly shown in his mastery of chiaroscuro and his accurate drawing. He was a close student of nature and almost wholly free from the trammels of the antique. Besides the works already named, the Louvre contains *La Belle Ferronière*, which is probably by him, and there are a great many of his drawings in various collections. His Treatise on Painting is his best-known literary work, and is included, with translation, in Dr J. P. Richter's *Literary Works of Leonardo da Vinci* (1883). It is worth mention that Leonardo was left-handed and wrote from right to left, using a sort of phonetic spelling. See Uzielli's *Ricerche intorno a L. da Vinci* (1872 and 1884); Heaton's *L. da Vinci and his Works* (1874); Grothe's *L. da Vinci als Ingenieur und Philosoph* (1874); Richter's *L. da Vinci* (1880); and Rosenberg's *L. da Vinci* (1898).

**VINE.** The vine order of plants, *Vitaceae*, consists of climbing shrubs with tumid joints, the woody tissue abounding with large dotted ducts, which at certain seasons pour out a profusion of sap; leaves simple or compound; producing small green flowers arranged in a thyrsus, a panicle, or an umbel; peduncles sometimes changing into tendrils; calyx small, nearly entire at the edge; petals four or five, inserted on the outside of a disk surrounding the ovary; stamens equal in number to the petals, inserted upon the disk; ovary usually two-celled; berry round, often by abortion one-celled, pulpy, seeds bony. The plants of this order are found chiefly in Asia and America. The best known of the species, and one of the most extensively cultivated and useful of plants, is the *Vitis vinifera*, the grape-vine. Amongst the other species it is distinguished by possessing lobed sinuately-toothed, naked or downy leaves. The varieties of this species are very numerous, both occurring wild and resulting from its wide-spread

cultivation. Its native country cannot be determined satisfactorily; like the cereal grains it has followed the footsteps of man. It appears to be truly indigenous in the East, in the region between the Black and Caspian Seas. It may be doubted whether it is indigenous in any part of Europe, although it occurs wild in some parts of France, Germany, Portugal, and Italy. The cultivation of the plant extends from near 55° N. lat. to the equator, but in south latitudes it only extends as far as 40°. It is cultivated at various elevations, in Germany ascending to a height exceeding 1000 feet above the sea-level, on the south side of the Alps it reaches 2000 feet, in the Apennines and Sicily 5000 feet, and on the Himalayas 10,000 feet above the level of the sea. It succeeds best in those countries which enjoy a long summer, and in which the temperature of the months of September and October is sufficiently high to allow the fruit to ripen thoroughly. France is probably the greatest vine-growing country in the world. In recent times the vine has been subject to a disease caused by the growth of a fungus, and known by the name of *Oidium*. It appeared in England in 1845; two years afterwards it attacked the vineries at Versailles; and in 1852 it spread over France, Italy, and Spain, and extended to Madeira. In ten years later this disease had abated its ravages; but still more recently the vine has been subject to another destructive disease produced by an insect called the *Phylloxera* (which see). In planting the varieties known to produce the best wine, it is of importance to select such as arrive at maturity at the same period, otherwise much inconvenience will be experienced. The vine is universally propagated by cuttings, either a foot or more long, with a portion of two years old wood; or short, with only one bud, or one bud and half a joint, &c. New varieties, however, can only be obtained from seed; and a seedling, carefully treated, will show blossoms in its fourth or fifth year. But the diversity of wines appears to depend more on soil, climate, and exposure, than on the particular variety. The Burgundy may be considered the most general vineyard grape of France, from Champagne to Marseilles and Bordeaux. The best wine in Italy and Spain is also made from grapes of this description; but in both countries many of the larger-berried sorts are raised, as being more productive of liquor. The sweet wines are made from sweet-berried grapes, allowed to remain on the plants till over ripe. That wine is the strongest, and has most flavour, in which both the skins and stones are bruised and fermented. As a general rule, the varieties most esteemed for wine-making have small berries and bunches, with an austere taste. In certain localities the vine lives only twenty or thirty years; but under favourable circumstances it may last several hundred. The time of flowering is a critical moment: heavy rains, drought, or a sudden fall of temperature, at this period, may produce the partial or even total destruction of the vintage. Most varieties bear only once in the season, some oftener, especially in warm climates.

The fruit of the vine is in various ways used as food. In the fresh state the grape has an agreeable sweet acid flavour, which renders it universally acceptable. It would appear that the ancients were in the habit of drinking the expressed juice of the grape before fermentation set in. Grapes are extensively used in the dry state under the name of raisins. The drying is effected by cutting half through the footstalk whilst they are suspended on the tree. Grapes thus dried are called muscatel raisins, and are chiefly imported from Spain and the Levant. The dried currants of commerce are the produce of the small seedless Corinthian grape

which is cultivated in many of the Greek islands. The formula of the sugar of grapes, or dextrose, is  $C_6H_{12}O_6$ ; that of cane-sugar, or sucrose, is  $C_{12}H_{22}O_{11}$ . See SUGAR.

The vine is one of the plants named in the most ancient historical records, and the grape has been in use for the making of wine for more than 4000 years. The Phœnicians were the first to introduce the vine into Europe, transporting it into Greece and Italy, whence it spread into France, Germany, and other parts of the Continent. Vineyards existed in England long previous to the Norman Conquest, and it is known that the abbey and religious houses usually possessed a vineyard. The inmates of these institutions were many of them foreigners, and they contributed to render the cultivation of the vine tolerably successful. The names of several places in Kent are supposed to be derived from their having been the site of vineyards. It was in the south of England that vineyards were most numerous, but there is evidence of a vineyard as far north as Derbyshire. In the reign of Henry II. the cultivation of the vine in England began to be neglected. Her intimate connection with France—her actual possession indeed of a portion of the wine-growing districts of that country—contributed to produce this change. But though the making of wine was no longer carried on in so extensive a manner, yet there is the testimony of Dr. Plot, Barnaby Googe, Samuel Hartlib, and others, to the fact, that during the sixteenth and seventeenth centuries a considerable quantity of native wine was still made in England from the produce of the grape. In the gardens at Hampton Court Palace is an old and celebrated vine, said to be the largest in Europe; it was planted in 1769, and measures 72 feet by 20; in one season it has been known to produce 2272 bunches of grapes, weighing 18 cwt.; the stem is 13 inches in girth.

Artificial heat was not applied to the production of grapes before the beginning of the 18th century. In Lawrence's Fruit Calendar, 1718, it is stated that at the Duke of Rutland's, at Belvoir Castle, fires were constantly kept up from Lady Day to Michaelmas, behind the slope-walks on which the plants were trained. The vinery of the Duke of Portland, at Welbeck, near Worksop, was the most celebrated in the country a little after the middle of the century. It contained seventy different varieties of the vine, all of which were raised to the highest state of perfection. Here a bunch of Syrian grapes was produced weighing 19½ lbs. The grapes grown for dessert in the vineries of Great Britain, with all the advantages of modern methods of heating and improved skill in cultivation, are unsurpassed by the produce of the most celebrated grape-growing countries. For the manufacture of wines see WINE.

VINEGAR (*acetic acid*), the name given to dilute acetic acid employed as a condiment. The varieties of vinegars known in commerce are five: 1, wine vinegar; 2, malt vinegar; 3, cider vinegar; 4, sugar vinegar; 5, wood vinegar.

The following is the French method of making wine vinegar:—The wine destined for vinegar is mixed in a large tun with a quantity of wine lees; and the whole being transferred into cloth sacks placed within a large iron-bound vat, the liquid matter is forced through the sacks by superincumbent pressure. What passes through is put into large casks set upright, having a small aperture in their top. In these it is exposed to the heat of the sun in summer, or to that of a stove in winter. Fermentation supervenes in a few days. If the heat should then rise too high, it is lowered by cool air and the addition of fresh wine. In the skilful regulation of the fermentative temperature consists the art of making good wine vinegar.

In summer the process is generally completed in a fortnight; in winter double the time is requisite. The vinegar is then run off into barrels, which contain several chips of birch wood. In about a fortnight it is found to be clarified, and is then fit for the market. It must be kept in close casks.

In Great Britain vinegar is usually made from malt. By mashing with hot water 100 gallons of wort are extracted in less than two hours from one boll of malt. When the liquor has fallen to the temperature of 75° Fahr. 4 gallons of the barm of beer are added. After thirty-six hours it is racked off into casks, which are laid on their sides and exposed, with their bung-holes loosely covered, to the influence of the sun in summer; but in winter they are arranged in a stove-room. In three months this vinegar is ready for the manufacture of sugar of lead. To make vinegar for domestic use, however, the process is somewhat different. The above liquor is racked off into casks placed upright, having a false cover, pierced with holes, fixed at about a foot from their bottom. On this a considerable quantity of *rape*, or the refuse from the makers of British wine, or otherwise a quantity of low-priced raisins, is laid. The liquor is turned into another barrel every twenty-four hours, in which time it has begun to grow warm. Sometimes the vinegar is fully fermented as above without the *rape*, which is added towards the end to communicate flavour. Cider is the principal source of vinegar in the northern states of N. America. The strongest commercial vinegar has a specific gravity of 1.019, and contains 5 per cent. of real acetic acid.

A crude vinegar has long been obtained from wood for the use of the calico-printers. It is sometimes known under the name of *pyroligneous acid* (which see). For a description of the acid (acetic) which is the main constituent of vinegar, see the article ACETIC ACID.

Vinegar is largely used as a condiment, both alone and as an ingredient in manufactured sauces, and in preserving animal and vegetable substances, which, when preserved in vinegar, are said to be pickled. It is considered, in common with other vegetable acids, to promote the digestion of oily food. When taken immoderately, which an excessive love of pickles is apt to induce, it is very injurious to the stomach. It is sometimes used deliberately as a counteractive of a tendency to corpulency, but it has no such effect, except by inducing indigestion, and depriving the system of a proper supply of nutriment. Strong acetic acid is used medicinally as an irritant. It reddens, and if long applied, blisters the skin. It removes warts, &c., by acting on their albuminous and gelatinous constituents. Diluted vinegar is grateful as a refrigerant when applied to the skin in a heated or fevered condition, and is often used for sponging the skin. Aromatic vinegar was formerly considered a protection against infection from diseases which are propagated by the contamination of the air, but it has, in reality, no disinfecting power. Vinegar forms a useful ingredient in gargles for the throat, and in washes for some affections of the eye. Internally it is most frequently used as a medium for exhibiting other medicines.

VINEGAR-EEL. See NEMATHELMIA.

VINET, ALEXANDRE-RODOLPHE, a Swiss theologian and writer, was born at Lausanne on 17th June, 1797. He studied for the Protestant church, of which he was ordained a minister in 1819, having two years previously been appointed, when only twenty years of age, professor of the French language and literature at the gymnasium of Basel. In 1829 he published his *Chrestomathie Française*, originally intended as a text-book for his class, and comprising a valuable survey of French literature. Subse-


quently to this he was a prolific contributor to the journal *Le Semeur*, started in 1831; and in 1837 published a selection of essays written for it under the title of *Essais de Philosophie Morale*. In the year last mentioned he likewise accepted the chair of practical theology in the Academy at Lausanne, but gave it up in 1845, and seceded from the national church, holding the principle that there should be no connection between church and state. His views on this subject were enforced in his *Essai sur la Manifestation des Convictions religieuses, et sur la Separation de l'Eglise et de l'Etat* (1842). He died 4th May, 1847. As a preacher Vinet was noted for his eloquence and earnestness, qualities which also form the distinguishing characteristics of his written works. In addition to those already referred to, may be mentioned his *Discours sur quelques sujets religieux*, and *Nouveaux Discours*, selections from both of which have been published in English, under the title of *Vital Christianity; Études Évangéliques et Nouvelles Études Évangéliques*, translated into English as *Gospel Studies*. His *Histoire de la Littérature Française, au XVIII<sup>e</sup> Siècle; and Études sur la Littérature Française du XIX<sup>e</sup> Siècle* display considerable critical insight.

**VIOL**, a class of ancient musical instruments which may be regarded as the precursors of the modern violins. They were fretted instruments with six strings, and were played on with a bow. There were three instruments differing in pitch in a set, the treble, tenor, and bass viol, and in concerts they were commonly played in pairs: two treble, two tenor, and two bass. The bass viol was the last to fall into disuse, which it did about the close of the 18th century.

**VIOLA**. See **VIOLIN**.

**VIOLACEÆ**. See **VIOLET**.

**VIOLET** (*Viola*), the popular name given to the species of the natural order *Violaceæ*, which are favourite flowers in all northern and temperate climates, and many of them among the first to make their appearance in the spring. The corolla is composed of five unequal petals, of which the inferior one is the largest, and is more or less prolonged into a spur at the base. The roots are mostly perennial; the stem almost wanting in some species, and distinct in others; the leaves are alternate, provided with stipules at the base, and the flowers are disposed on axillary peduncles. More than a hundred species are known. Although the violet has given its name to one of the primitive colours, we must not imagine that it is always of a violet hue; it is often blue, purple, lilac, or white, and the *Viola tricolor*, or heart's-ease, is partly yellow. The flowers were formerly considered useful in diseases of the chest; but this belief is now exploded. The root, however, is an emetic, and may be useful as a domestic remedy in country practice. The dose is 40 grains. The infusion of violets is one of the most delicate tests of the presence of acids and alkalies; the former changes its colour to red, the latter to green.

**VIOLIN**, a musical instrument consisting of four strings stretched by means of a bridge over a hollow wooden body, and played on with a bow. The principal parts of the violin are the *scroll* or *head*, in which are placed the pins for tightening and slackening the strings; the *neck*, which connects the scroll with the body and to which the *finger-board* is attached, that is, the board upon which the strings are pressed down or stopped by the fingers of the left hand as it holds the neck in playing; the *belly* or upper surface of the body, over which the strings are stretched, and which has two sound holes, one on each side in this shape ; the *back* or under side; the *sides* or *ribs*, uniting the back and belly and

completing the body; the *tail-piece*, a piece of wood of somewhat triangular shape, to the broad end of which the strings are fastened, and which is attached by a piece of catgut to a knob at the opposite end of the body from the head, and so is stretched above the belly; and the *bridge*, rising between the tail-piece and the finger-board, with one of the sound-holes on each side. The back and belly have both a considerable convexity, and the edge of the bridge on which the strings rest is also convex so as to allow of each being touched separately by the bow. Some instruments consist of as many as fifty-eight different pieces, but so minute a division is not necessary. The back, neck, and sides are generally of sycamore, the belly of deal, the finger-board and tail-piece of ebony. Almost all the different pieces are fastened together with glue. The strings are of catgut, the lowest or bass-string being covered with silvered copper wire, silver wire, or even gold wire.

Instruments of the violin kind have been in use from an unknown antiquity. The viola, which preceded the violin in Europe, has been traced back to the eighth century. In several important respects the violin is superior to almost every other instrument, and there is none which combines so many excellencies. Within its range it can take every interval of pitch to the minutest fraction, its susceptibility of division being limited only by the delicacy of manipulation of the performer; so that it can always be played either in just intonation, or in any temperament required by the accompanying instruments. It is thus equally adapted to solo and orchestral performances. For the former it is fitted by its clear and brilliant tone, as variable in volume as in intonation, inexhaustible in continuity and variety of shading, and capable of the sharpest strokes of *staccato* as well as of the most sustained efforts of *legato* music. Its place in the orchestra is marked by these perfections as the leading one, to which the melody is intrusted. As a solo instrument it has also a peculiar faculty of imitation, not only of the tones of other instruments, but of non-musical sounds, as far as they are capable of musical imitation. This and its indefinite range are somewhat liable to abuse.

As an orchestral instrument its powers are multiplied by the construction of similar instruments varying in size, but nearly identical in principle and form of construction. The full orchestral set consists of the violin, which is used for first and second parts; the viola, or tenor violin; the violoncello, or bass-violin; and the violone, contra-basso, or double-bass violin, which usually accompanies the violoncello at an octave of interval. The four strings of the violin are tuned at intervals of fifths, thus



The highest range of the instrument depends to some extent upon the performer, but the high notes when forced are apt to be thin and squeaky. Its legitimate extent exceeds three octaves. The violin can, to a limited extent, be made to produce harmony by sounding two or three strings together, but this is only a *tour de force*, not suitable for rendering a sustained composition, although a fugue in four parts for a single violin has been written by Sebastian Bach. The viola is

tuned thus the music being written

in the alto clef. Its range extends to the G above the treble clef. The violoncello is tuned its compass extends to the A above the second line

in the treble clef. With the assistance of harmonics it may be carried one or two octaves higher. The double-bass has three, four, or five strings. For its range, &c., see CONTRA-BASSO.

The structure of the violin is still imperfectly understood by musical mechanists. The finest violins are by old makers, which cannot be imitated, and the precise cause of their superiority has never been satisfactorily explained. The Cremona violins stand in the first rank, the celebrated masters of this school being the Amati, Antonio Stradivari (Straduarini), and Giuseppe Guarneri (Guarnerius); of German makers Stainer or Steiner and Klotz (both belonging to Tyrol) are the most celebrated; Vuillaume of the French; and Forrest of the English.

VIOLONCELLO. See VIOLIN.

VIPER (*Vipera*), a genus of Serpents belonging to the sub-order Viperina, and to the family Viperidae. The Vipers are characteristic serpents of the Viperine or typically poisonous section of Snakes, and like the other members of that section possess no teeth save the two hollow poison-fangs on the upper jaw. The family Viperidae is further distinguished by the flattened top of the head, by the lateral eyes, and by the nostrils existing at the sides of the muzzle. The head is separated from the body by a distinct constriction or neck. The Vipers have no pits or depressions between the eyes and nostrils, as in the allied family Crotalidae or Rattlesnakes (which see). The nose is curved upwards in the genus *Vipera*, and the shields on the head are flat and high at the sides. The Common Viper or Adder of Britain (*Vipera berus*) appears to be very local in its distribution. It attains a length of from 1½ to 2 feet, and may be found to be variously coloured. Its most frequent and stable markings appear to be a brownish-yellow ground colour, with a series of continuous zigzag markings along the back, and a set of triangular black spots along each side. Specimens are frequently found with light tints and sometimes nearly black. The Common Harmless Grass or Ringed Snake (*Coluber natrix*) of Britain wants the black back marks of the Viper. The Viper is the only poisonous reptile of which Britain can boast. Its bite does not appear in the adult to be productive of fatal consequences, but may induce pain, sickness, fever, and even delirium as a sequence to the latter. The effects have been known to persist for a fortnight or more; and in children a fatal result has occasionally followed the adder's bite. The Viper has been alleged to receive its young into its mouth and thus to save them from danger. Observations would seem to show that probably the young are really received into the throat; but are certainly not swallowed, and again rejected at will, as the popular belief runs. The food consists of frogs, mice, birds, eggs, &c. The Viper is viviparous—retaining its eggs within the body till the young are hatched. Various other Serpents are denominated Vipers in a popular sense. The Black Viper (*Heterodon niger*) inhabits North America; the Death Viper or Adder (*Acanthophis antarctica*) is found in Australia; the Horned Viper or Asp (*Cerastes Hasselquistii*) and Plumed Viper (*Crotho cornuta*) of North Africa; and the Water Viper (*Cenchrus piscivorus*), are examples of Snakes known under this designation. See Plate II. at article REPTILES, figs. 11–14.

VIRGIL (PUBLIUS VIRGILIUS or VERGILIUS MARO), the most distinguished epic, didactic, and pastoral poet of ancient Rome, was born at Andes (probably Pietola), a little village near Mantua, 15th October, 70 B.C. His father appears to have possessed a small estate there, which he cultivated himself. Virgil studied at Cremona and Milan, took the toga virilis

at the former at the age of sixteen, and probably proceeded to Naples for the purpose of improvement. He studied the Epicurean philosophy under a certain Syro, probably at Rome. Varus, to whom the sixth eclogue is addressed, was probably his fellow-pupil. It has been generally supposed that the poems which bear the inscription *Catalecta Virgili*, were composed by him at an early age; but modern criticism has shown that some of them are evidently not his, and that others are of uncertain date. If we are to suppose that Virgil describes himself under the character of Tityrus in his first eclogue, he was thirty years of age when he went to Rome for the first time, to obtain the restoration of his farm, which had been taken possession of by the soldiers of Octavius and Antony, after the close of the war against the republicans. He was here presented, by Pollio or some other friend, to Augustus, and gained the favour of Mæcenas, through whose intercession he obtained the restitution of his property. But on his attempting to take possession of it the new occupants resisted him, and threatened his life; and it was not until after a second journey to Rome, and repeated efforts, that he finally succeeded in his object. This is the common story, but its accuracy is not firmly established. About this time he wrote several eclogues, the tenth and last of which is ascribed to the thirty-third or thirty-fourth year of his age. His *Georgics* (poem on agriculture), which he undertook at the suggestion of Mæcenas, was completed in B.C. 31. He is said to have spent seven years upon this work, of which the termination at any rate was written at Naples; but these accounts of him are not well authenticated. The *Æneid* was probably begun or contemplated about B.C. 27, at which date Augustus wrote to Virgil from Spain, desiring to have a monument of his poetical talent. The dates of different portions of the *Æneid* are fixed inferentially at B.C. 28 and 20, by incidents introduced into them; but as an allusion might be introduced into a part of the work previously finished, this only proves that the work was in progress at these dates. In B.C. 20 Virgil, whose health was declining, appears to have engaged on a tour of Greece. But Augustus having arrived at Athens on his return from the East Virgil determined to accompany him home. At Megara, however, he fell sick; and his disease becoming aggravated on the journey, he died at Brundisium, B.C. 19. His body was carried to Naples in compliance with directions given by himself, and there interred by the side of the Puteolan Way at the second milestone from Naples. According to well-authenticated accounts, the poet on his death-bed ordered the *Æneid* to be burned, as an unfinished and defective work; but it was preserved by his friends L. Varius and Plotius Tucca. Virgil passed an easy and comfortable life, being enriched by the munificence of his patrons, and enjoying the friendship of the most accomplished men of the day, including the poet Horace. He was amiable and modest, free from envy and jealousy, and of irreproachable character. As a poet the first place must be assigned to him among the many distinguished authors of his age. If he had not the inventive talent in its highest degree—for in his *Eclogues* he imitated Theocritus, in his *Georgics* Hesiod, and in his *Æneid* Homer—yet he deserves our admiration for his command of language, which he displays in all gradations, from the simplest and sweetest strains of the pastoral to the most splendid and lofty descriptions of the epic; for the beauty of his versification, in which, particularly in his *Georgics*, he is unrivalled; and for the taste and skill with which he manages all the materials of poetry.

In the legends of the Middle Ages he appears as a benevolent enchanter, in which character many stories were current regarding him in Italy. The chief annotated English edition of Virgil's works is that of Conington and Nott; other useful editions are by Kennedy, Papillon, and A. Sidgwick respectively. Among prose translations are those by Lonsdale and Lee, Conington, and Mackail. The great verse translation is that of Dryden. See also Prof. Sellar's *Roman Poets of the Augustan Age*.

**VIRGINIA** one of the United States of North America. Since its separation from West Virginia (see following article) Virginia is bounded north by West Virginia and Maryland; east by Maryland and the Atlantic Ocean; south by North Carolina and Tennessee; west by Kentucky and West Virginia. The area of Virginia before its division was 64,770 square miles; the area now is 40,125 square miles. The state presents a considerable variety of surface, and may be divided into three sections. The seaboard or tide-water district, comprising thirty-seven counties, is generally level, being not more than 60 feet above the tide in its highest parts. The second district, extending inland to the Blue Ridge or eastern chain of the Alleghany Mountains, is more varied and elevated. The third section is crossed from S.W. to N.E. by the great range of the Alleghanies, the different chains of which, known by various local names, inclose extensive and fertile valleys. The width of the mountainous district is from 80 to 100 miles. The highest point is Balsam Mountain in Grayson county, 5700 feet above the level of the sea. The western chains of the Alleghanies, the Shenandoah, Greenbrier, and Great Flat Top Mountains separate the state from West Virginia. The valleys comprised in the mountain district form a table-land of from 1200 to 1500 feet above the level of the sea. The mountain district is formed of various sandstones and shales; from the foot of the Blue Ridge chain a broad belt of primary formation stretches east; and from thence to the seacoast runs a tract of tertiary formation. The central counties, Fluvanna, Orange, Spotsylvania, Goochland, and Buckingham contain gold mines, of which the produce is considerable; but the working of them has proved rather expensive. The same district also contains productive copper mines. Coal and iron are abundant. The principal rivers are the Potomac; the Rappahannock, the York, and the James, which flow into Chesapeake Bay, with their numerous affluents. The Roanoke passes into North Carolina. The climate varies much according to locality. The staple products are tobacco, cotton, and flax; Indian-corn, wheat, and oats are the chief grain crops. Cattle and sheep are numerous, and dairy produce is exported. Virginia is one of the original states of the Union. It received its first English colony in 1607. The capital and largest city is Richmond. Pop. (1890), 1,655,980; (1900), 1,854,184.

**VIRGINIA, WEST**, one of the United States of North America, formerly forming part of Virginia; bounded north-west to north-east by Ohio, Pennsylvania, and Maryland; east and south by Virginia; and west by Kentucky; the area is given as 24,645 square miles; capital, Charleston. It is traversed by spurs of the Alleghanies, the western chain of which chiefly forms the boundary between it and Virginia, and the country is generally hilly and mountainous. It contains much fine scenery, grand and rugged landscapes alternating with scenes of sylvan beauty. Its principal rivers besides the Ohio are the Great and Little Kanawha, and the Big Sandy River on the Kentucky border, all flowing to the Ohio. It possesses lead, iron, coal, and salt

mines. The beds of coal and iron are very extensive. The climate is mild and healthy. The soil is generally productive even on the sides and tops of the hills, and there is abundance of timber. Indian-corn, wheat, oats, potatoes, and butter are the chief productions. Wheeling is the largest city. When Virginia seceded from the Union in 1861 the portion now forming West Virginia protested against this action, formed a provisional government of its own, and was admitted into the Union by act of Congress in 1862. Pop. in 1890, 762,794; in 1900, 958,800.

**VIRGIN ISLANDS**, a group of about 100 small islands in the West Indies, occupying a space of about 100 miles long by 20 miles wide, east of Port Rico. Not above a fourth are inhabited and cultivated. The chief exports are sugar, molasses, rum, cotton, and salt. The Virgin Islands are shared by Great Britain, which has about fifty, the principal being Tortola, Anegada, and Virgin Gorda; Denmark, which has St. Thomas, Santa-Cruz, and St. John, with a considerable number of islets; and Spain, which has Culebra, Crab Island, and several islets. The Virgin Islands that belong to Britain have an area of 58 square miles, and a pop. in 1901 of 4908. The imports in 1900 were valued at £3387, the exports at £2812. The revenue is over £2000. There is an administrator of the islands under the governor-in-chief of the Leeward Islands. The group was discovered by Columbus on his second voyage in 1494.

**VIRGIN MARY**. See **MARY, MARIOLATRY**, and **SAINTS**.

**VIRGINS, ELEVEN THOUSAND**. See **URSULA (St.)**.

**VIRGIN'S BOWER**. See **CLERMATIS**.

**VIRGULARIA**, or **SEA-ROD**, a genus of Cœlenterate animals, belonging to the class Actinozoa and to the order Alcyonaria. These organisms, nearly allied to the Pennatulæ (which see) or Sea-pens, are of compound nature, and consist of an aggregation of polypes, each possessing eight fringed tentacles. The living polypes of Virgularia are supported by a rod-like body of calcareous nature, which represents a sclerobasic coral. (See **SCLERODERMIC CORAL**.) This rod is of slender make and construction, and has hence derived its name of 'Sea-rod'. Numerous branches bearing the little polypes are given off from the central rod-like axis. *Virgularia mirabilis* is a familiar species.

**VIRIATHUS**, a brave Lusitanian, originally a herdsman, who maintained a struggle against the Romans in defence of his country for about ten years from 151 B.C. onwards. After inflicting various defeats on the enemy, he hemmed in a Roman force in a difficult position, and the commander, Q. Fabius Servilianus, concluded a treaty with him in order to save his army. This was ratified by the senate; but Servilius Cæpio, who succeeded to the command in Further Spain during the same year, renewed the war, and shortly after had Viriathus assassinated (B.C. 140).

**VISCONTI**, an old Milanese family, celebrated for its political consequence and its patronage of science. History makes mention of the Visconti in the eleventh century; but they disappear from the time of the destruction of Milan by Frederick Barbarossa, when, with some other noble families, they were obliged to yield to the superior power of the opposite party, the Torriani or family Della Torre. The first of the Visconti who laid the foundation of their greatness was OTTONE, created archbishop of Milan in 1263, and perpetual lord of Milan in 1277 (died 1295), who gained the ascendancy over his enemies, and bequeathed his power to his nephew, MATTEO (died 1322). The latter was, however, driven into banishment by the Torriani, but after living in exile seven years, had the address to obtain the title



of Imperial vicar, which he soon exchanged for that of Lord-general of Milan (1817). Matteo transmitted the supreme power to his eldest son, GALEAZZO, who was overpowered by his enemies and thrown into prison by Louis of Bavaria in 1827. He was soon after released, and died at Brescia in 1828. His son AZZO, who succeeded him and increased the extent of his dominions, was not less distinguished for his pacific virtues than for his military talents. He died in 1839. His uncle LUCCINO succeeded him. The latter extended still farther the dominions of the family, and was the first of the name who was distinguished as a patron of science and art. He corresponded with Petrarch. After his death in 1849 his brother, GIOVANNI (died 1854), archbishop of Milan, assumed the reins of government. He was a zealous patron of letters. He appointed a commission of six learned men to compose a commentary on Dante, fostered the University of Bologna, and received Petrarch on his arrival at Milan with the highest marks of distinction. Giovanni was succeeded by his nephews MATTEO II., BERNABÒ, and GALEAZZO II. Matteo died within a year; and his two brothers, who shared their estates on his death, though eminent for their warlike talents, rendered themselves obnoxious by their cruelty and other vices. Galeazzo, however, continued to treat Petrarch with the same respect that his predecessors had shown him, and employed him in several negotiations. He was succeeded in 1378 by his son GIAN GALEAZZO, who imprisoned his uncle Bernabò in the castle of Trezzo, and took upon himself the sole government (1385). In him the Visconti family reached the summit of its grandeur and splendour. In 1395 he received from the Emperor Wenceslaus the ducal dignity; and his territories were more extensive than those of any of his predecessors. Pisa, Siena, Perugia, Padua, and Bologna were subject to his sceptre; and he had already shown a disposition to assume the title of King of Italy, when his ambitious projects were cut short by his death of the plague (in 1402). He fostered science and art, collected the most distinguished scholars at his court, restored the University of Piacenza, and connected that of Pavia with it, and founded a large library. He built the celebrated bridge over the Ticino at Pavia, and began the magnificent cathedral at Milan (1386-97). Gian Galeazzo left three sons, GIAMMARIA, FILIPPO MARIA, and an illegitimate child, GABRIEL. Giammaria succeeded to the dukedom, and was assassinated in 1412, after which Filippo Maria reigned alone till his death in 1447 without male heirs. His natural daughter, BIANCA, had been married to Francesco Sforza, who was named duke of Milan in 1450. See SFORZA and MILAN (DUCHY OF).

VISCONTI, ENNIO QUIRINO, a celebrated Italian archaeologist, was born at Rome in 1751. He was the son of Giovanni Battista, also a well-known archaeologist, and from his earliest years was trained in the habits of an antiquary. He continued the work begun by his father, entitled *Il Museo Pio-Clementino descritto*, of which he wrote the greater part even of the first volume, which bears his father's name. It extended to seven volumes, the last of which was published in 1807. In 1785 he was appointed keeper of the Capitoline Museum. In 1798 he was named one of the five consuls of the Roman Republic, and during a consulate of seven months he founded the Roman Institute. In 1799 he left Italy and settled in Paris. Before his arrival he was appointed an administrator of the museum of the Louvre, and a chair of archaeology was created for him. He became a member of the Institute in 1803, and of the Academy of Inscriptions in 1804. He visited London in 1815. He died at Paris 7th

February, 1818. The archaeological works of Visconti are very numerous. Among the most popular are *Description des Antiques du Musée Royal*; *Description des Vases peints du Musée*; *Iconographie grecque*; and *Iconographie romaine*. He contributed to the scientific journals of France and Italy, and to the *Magasin Encyclopédique*, and the *Biographie Universelle*. His complete works appeared at Milan in 1824, seq., in Italian and French (*Opere tutte, divise in tre Classi*: 1st division, eight vols.; 2d, five vols.; and 3d, eight vols.), with numerous engravings.

VISCOSITY, the cohesive quality of liquids which is exemplified in the flow of such substances as tar or treacle. The least viscous of liquids are such as benzoline, turpentine, and ether; pitch is a case of extreme viscosity.

VISCOUNT, in England, the fourth title of nobility, indicating a rank between an earl and a baron. (See TITLES OF HONOUR.) The first viscounts in England were created in the reign of Henry VI.; and they have never been numerous.

VISHNU, called 'the Preserver', the second god of the Hindu triad, and by his special worshippers considered to be the greatest. In the article INDIA—Religions, it has been mentioned that the development of the Hindu religion is naturally divided into three periods. In the first, or Vedic period, Vishnu is one of the gods who represent the various qualities of the sun. In a few hymns he is specially distinguished, but in general he is classed without distinction with gods who were regarded as inferior to Indra, and fewer hymns are dedicated to him than to some others. In the second or epic period, Vishnu is elevated to the rank of first of the *Ādityas* or luminous offspring of *Aditi* (space). Of the two great epics—the *Rāmāyana* and the *Mahābhārata*—the former is entirely devoted to the glory of Vishnu, one of whose *avatāras* it celebrates; the latter is divided between him and Śiva, the third god of the triad, whose worship during its period began to prevail over that of Vishnu. In the third period, which is represented by the *Purāṇas*, the worshippers of Vishnu and Śiva are divided into different sects, and their respective creeds are propagated in separate *Purāṇas*. The distinctive characteristic of the worship of Vishnu is his *avatāras* or incarnations, which greatly excel in number and importance those of Śiva or any other god. The number of the *avatāras* of Vishnu varies in different authorities. Sometimes they are regarded as almost innumerable; but there are ten principal *avatāras* distinguished by specific names. Some of these *avatāras* appear to have had at first a purely comical character and others to have been founded on great historical movements of a religious nature. Vishnu is always represented as becoming incarnate to oppose the power of the demons, restore the authority of the gods, or otherwise to effect some beneficial change in the government of the universe. The last *avatār* is yet future. See AVATAR, INDIA—Religions, SANSKRIT LANGUAGE AND LITERATURE, and VEDAS.

VISIBLE SPEECH, the name given by its inventor, Alex. Melville Bell, to a system of alphabetical characters designed to represent every possible articulate utterance of the human organs of speech. It is based on an exhaustive classification of the possible actions of the different organs concerned in speech, and to every organ and every mode of action of an organ a symbol is assigned. Of these radical symbols there are in all thirty, and by combinations of these thirty symbols some hundreds of characters may be formed to represent the sounds of the human voice, but little more than a hundred characters are actually required for all the ascertained sounds of different languages, and only two-thirds of the thirty radical



symbols are required in forming the signs or letters necessary for the writing of any European language. In form the letters are as simple as those of the Roman alphabet. After completing this system, Mr. Bell submitted it to the consideration of a large number of gentlemen well qualified to judge of its value, and allowed it to be tested in their presence in such a manner as to make quite clear its efficiency for the purposes for which it was devised. Mr. Bell afterwards published his system, and its theoretical completeness is acknowledged by everyone who has inquired into the matter. It is manifest that the benefits that may be derived from such a system as this are enormous. If it is the case, as is asserted, that by means of it perfectly illiterate persons could learn to read their own language, whatever that might be, in a few days, or even in a few hours, that one fact will enable us to realize of what immense use the system would be if it were extensively used for printed books. It might also be applied with great advantage as a key to the pronunciation of foreign languages. The system has been successfully applied in the United States to the teaching of deaf-mutes, and has been very widely adopted; it has made little progress in England as yet. See Bell's Visible Speech: the Science of Universal Alphabets.

**VISIGOTHS**, or **WEST GOTHS**, the western branch of the Goths (see **GOTHS**), who after the death of Theodosius broke into Italy under Alaric, and captured Rome in 410. Alaric died later in the same year before he had matured his plans, and after his death his brother-in-law Athaulf, who was placed at the head of the nation, turning towards Gaul, made new conquests on both sides of the Pyrenees. He reached Barcelona, where he was murdered in 415; but his successors continued to extend their dominions in Gaul and Spain. Wallia made a treaty with the Romans, and in return for certain services received under their nominal suzerainty, though in virtual independence, western Aquitania, with Toulouse as capital. He died in 419. His successor, Theodoric I. (419-451), was treated by the Romans as an independent ruler, and took part in the victory over Attila on the Catalaunian Fields in 451. Euric (466-483), third in succession to Theodoric, conquered the Suevi and other races, and is considered the founder of the Visigothic kingdom. Clovis, king of the Franks, on pretence that it was unjust to let the heretic Visigoths possess the fairest portion of Gaul, attacked the peaceful Alaric, Euric's successor, and defeated him at Vouglé in 507. The Franks obtained possession, without resistance, of most of the cities in Southern Gaul and the kingdom of the Visigoths would have been in great danger had not Theodoric, king of the Ostrogoths, undertaken its defence. While guardian of the Visigothic prince, his grandson, he embraced the favourable opportunity to make himself master of a part of the territories still belonging to the Visigoths in Southern Gaul; and after a long separation of the two nations there existed for a time an intimate connection of the Ostrogoths and Visigoths. After his death dissensions soon arose among the Visigoths, and the pernicious influence of the difference of religion between the Arian Visigoths and the Catholic provincials, who were sometimes tolerated and sometimes persecuted, became more and more evident. The kingdom of the Visigoths arose again with new energy under Leovigild (568-586), who totally subdued the Suevi, improved the laws, limited the power of the nobles, made Toledo the royal residence, and tried to render the regal power hereditary. His son Recared adopted, on his accession (586-601), the Catholic faith, upon which the divisions of the people ceased, and Goths and Spaniards became one

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nation. Under his reign was held the Council of Toledo. His conversion had the most important influence on the character of the government. As soon as the Catholic faith became the established religion, the clergy, who had become accustomed during their former state of oppression to adhere firmly together, acquired a predominant influence, and constituted a hierarchy independent of the Roman papal authority. The Arian bishops had lived quietly in their dioceses, and had no influence on the public administration; but the Catholic bishops strove after an active participation in public affairs in order to render secure the authority which their church had obtained. The grandees of the kingdom—the secular public ministers and officers of the court—(called *virii illustres officii palatini*), who formed a kind of nobility, and, as the constitutional counsellors of the king, usurped the rights of popular representatives, remained no longer the first class in the state; the old mode of choosing the king, which had thrown the election into their hands, was altered in favour of the bishops; and under weak kings, who often attained the crown by artifices of the priests, or solicited absolution and justification from the clergy on account of the usurpation which they had committed or the oaths which they had violated, these found it easy to place themselves at the head of the state and to procure exemption from all public burdens. This prevailing influence was especially visible in the ecclesiastical councils, which in previous times had discussed merely matters of doctrine or church discipline, but immediately after the conversion of the sovereign began to mingle with spiritual affairs matters of a political character. When the clergy had once established their political influence they could, without reluctance, allow the secular grandees, who came with the king to the councils, to take part in the deliberations, the more particularly as they could always be sure of outvoting them; and as early as 633 the regulation was made that those secular grandees alone should be admitted who should be pronounced worthy of the honour by the bishops. The internal disturbances, which the excessive power of the clergy produced or favoured, facilitated the conquest of the country by the Saracens, who were settled on the north coast of Africa. As early as the year 675 these Mohammedans began their attempts to settle in Spain, and during the reign of the weak Roderick were enabled to execute their project. The Goths were defeated in 711 at Xeres de la Frontera; the king was slain, and the Saracens spread themselves over the greatest part of the country. (See **SPAIN**.) The remainder of the Goths, who, after the downfall of the kingdom, fled to the mountains of Asturia and Galicia, founded there new kingdoms, in which the constitutions of the Visigoths were in part retained, and which, when their descendants broke forth from their fastnesses and wrested from the Moorish settlers one tract after another, finally gave rise to the Kingdoms of Spain and Portugal. The traces of the public institutions of the Visigoths were preserved in the laws. The most ancient collection of Spanish laws, the *Fuero Juzgo*, or *Forum Judicum* (see **FUERO**), is drawn from the ancient laws of the Visigoths; and many of their institutions have been retained to the present day in the provincial laws of Castile and Catalonia. The Spanish language contains a strong admixture of the Gothic element. See Hodgkin's *Italy and her Invaders* (1880-85).

**VISION**. See **EYE**, **OPTICS**, **SIGHT**.

**VISIONS**. See **APPARITION**.

**VISTULA** (German, *Weichsel*), a river about 650 miles long, navigable from Cracow, which rises on the frontiers of Galicia and Austrian Silesia, on

the northern declivity of the Carpathian Mountains, flows first eastwards past the town of Cracow, forming from a point about 15 miles below Cracow the boundary of Galicia and Poland, till it receives the San on the right bank, when it turns north-west through the Polish provinces, enters West Prussia a little above Thorn, and after traversing that province divides into two branches, of which the eastern, the Nogat, empties into the Frisches Haff; the western divides again about 5 miles from the Baltic into an eastern and a western branch, the latter, the Dantzig Vistula (which is much the larger), proceeding towards Dantzig, the former to the Frisches Haff. A new channel cut from the head of the Dantzig branch now carries most of the water directly to the Baltic. The navigation of this river is important, especially to Poland, though often obstructed by ice or shallow water. The canal of Bromberg connects the Vistula, through the Netz and Warthe, with the Oder. Several navigable rivers empty into it. The area of its basin is about 76,000 square miles.

**VITALIANS.** See **APOLLINARIANS**.

**VITELLIUS, AULUS**, a Roman emperor, remarkable only for his gluttony. He had managed to ingratiate himself in succession with Tiberius, Caligula, Claudius, and Nero, and Galba gave him the command of the legions in Lower Germany. On the death of Galba his troops proclaimed him emperor (January 2, 69 A.D.), and having defeated the forces of Otho he actually became master of the empire. In July of the same year the troops of Vespasian called him to the throne, and he having accepted the call sent his general, Primus, to depose Vitellius, which he succeeded in doing. Vitellius was dragged out of the palace, and put to death with every mark of ignominy (December 22, 69).

**VITEPSK**, or **VIREBSK**, a town in Russia, capital of the government of the same name, on the Duna, which is here navigable, and receives the Viteba, 315 miles south of St. Petersburg. It has few buildings of any note, and in 1887 the greater part of the town was destroyed by fire. Its manufactures are woollen and linen cloth, leather, and mead. It has a considerable trade. Pop. (1897), 66,143. — The government has an area of 17,433 square miles. The surface is generally flat, and much occupied by woods and morassua. The whole drainage is carried to the Baltic. The soil suits rye better than any other grain. The only mineral of value is iron. Pop. (1897), 1,502,895.

**VITERBO**, a town in Italy, in the province of Rome, and 40 miles north-west of the city of Rome. This city lies in a beautiful and fertile valley. Its chief edifices are a Gothic cathedral containing the tombs of four popes and numerous fine paintings; an ancient and dilapidated episcopal palace; the palazzo pubblico, &c. The trade is chiefly in sulphur and iron. About 2 miles from the city are the celebrated sulphur baths of Viterbo. Viterbo was the chief town of the allodial possessions of the Countess Matilda, which were given by her to the popes, and formed the patrimony of St. Peter. Pop. (1881), 19,941.

**VITORIA**, a town of Spain, in Biscay, capital of the province of Alava, agreeably situated on a gentle height overlooking an extensive plain, 65 miles north-east of Burgos. The old parts of the town are poorly built, but the new town is well laid out in spacious streets and squares. The principal buildings and establishments are four parish churches, one of them adorned with a fine altar-piece by Velasquez, a handsome modern palace of deputies, an academy of music, theatre, and prison. The chief manufactures are furniture, candles, and articles in leather. There is a brisk trade, especially in steel and iron, grain and

wine, as well as in the manufactures mentioned. It is the scene of two battles, the first fought in 1367 in which the Black Prince gained a victory for Pedro the Cruel; the second on the 21st of June, 1812, in which the Duke of Wellington concluded his series of great Peninsular victories, defeating the French under King Joseph and Marshal Jourdan. Pop. (1887), 27,660; (1897), 30,514.

**VITRIFIED FORTS**, the name given to certain ancient structures in Scotland to which attention was first called by John Williams in his Account of some Remarkable Ancient Ruins lately discovered in the Highlands and Northern Parts of Scotland (1777). The peculiarity to which they owe their name is that the materials of which they are constructed have acquired by the action of heat more or less of a glassy appearance and texture. Some of them are slight structures that show no sign of having been intended for forts; others are so put together that there can hardly be a doubt that that was the design of their construction. Among the latter is one on Craighphadric Hill near Inverness. One situated at Dunnydeer in Aberdeenshire is known to have been used as a fort down to the sixteenth century. It is still a matter of debate among antiquarians whether the vitrification was intentional or not. It has been suggested that the circumstance in question may be accounted for by supposing that these structures were used for beacons, or in religious ceremonies in which fire was used; and this suggestion agrees with the fact that the vitrification is in many cases confined to the interior. On the other hand, it is stated that vitrifiable stones have in some instances been brought from a distance for the construction of these forts, while there were unvitriifiable stones lying ready to hand at the site chosen, and this undoubtedly points to the conclusion that the former were selected with a view to vitrification.

**VITRIOL, GREEN**, the same as **copperas** or **sulphate of iron**. See **COPPERAS**.

**VITRIOL, OIL OF**, the common name for strong sulphuric acid (which see).

**VITRUVIUS POLLIO, MARCUS**, a celebrated writer on architecture, who is supposed to have flourished in the time of Julius Caesar and Augustus, and of whose parentage and place of nativity no certain knowledge can be obtained. The most probable opinion is, that he was born at Formia, a city of Campania, now called Mola di Gaeta. The Veronese, however, claim him as a fellow-citizen, and have erected a monument to his memory. He plainly appears to have been liberally educated; and that he travelled for information and improvement, we learn from his writings. The only public edifice which he mentions as being constructed from his designs is a basilica at Fanum Fortune (now Fano) in Umbria. He wrote at an advanced age his work *De Architectura Lib. X.*, which he dedicated to the emperor (without doubt, Augustus, although he is not named). This treatise, which is valuable as a compendium of those of numerous Greek architects, was first printed at Rome about 1486; and among modern editions, the most valuable are those of Schneider (Leipzig, 1808, four vols. 8vo), Straticio (Udine, four vols. 1825-30); and Rose and Müller-Strübing (Leipzig, 1867). An English translation of the work of Vitruvius, with a commentary by William Newton, appeared in 1771, folio, republished 1791, two vols. folio; and a new translation by W. Wilkins, with an Introduction, containing an Historical View of the Rise and Progress of Architecture among the Greeks, was published in 1812-17.

**VITTORIA.** See **VITORIA**.

**VITUS'S DANCE**, **St.**, or **CHOREA SANCTI VITI** (from Greek, *chorea*, a dance), is a spasmodic or con-

vulsive disease, in which the muscles of the extremities and other parts are thrown into various involuntary motions, and perform in an irregular manner those motions which are dictated by the will. The approach of the disease is commonly slow, and is indicated by a loss of the usual vivacity, by a variable and often ravenous appetite, a swelling and hardness in the lower belly in most cases, but in some a lank and soft belly, and in general a constipated state of the bowels. Slight, irregular, involuntary motions are soon observed, especially of the muscles of the face, which after a while become more violent. In general, when the patient wishes to be at rest, the muscles are perpetually moving, and distorting the limbs, face, and trunk; and when any motion is attempted by the will it is performed irregularly and with difficulty after several efforts. This disease attacks both sexes, but chiefly those who are of a weak constitution, or whose health and vigour have been impaired by confinement, or by the want of sufficient or proper nourishment. It appears most commonly from the eighth to the fourteenth year. Chorea and rheumatism are very closely allied. The disease is due to an irritable condition of the spinal cord, and is relieved by soothing and tonic remedies applied to that portion of the nervous apparatus. The name of St. Vitus's dance (*Veitstanz*) seems to have originated in Germany.

**VIVIPAROUS ANIMALS**, the name given to those animals which bring forth their young alive. Properly speaking, the name should be limited to that form of reproduction seen in Mammalia alone, in which the young during the whole course of their development are contained within the parent body, and bear to the parent organism a definite and intimate degree of relationship. Thus in Mammalia the young animal is contained within a special cavity, the uterus or womb, and is nourished by the blood of the parent during its development; whilst only at birth does it pass from the body of the parent to the outer world. This is a very different process from that observed in some fishes, and in several reptiles, in which the eggs, from which the young are produced, are retained within the parent's body until the young are hatched therefrom. Such forms are named *ovo-viviparous*, but there is no intimate or organic connection between the parent and offspring in such a case.

**VIVISECTION**, the practice of operating with the knife upon living animals. This practice may have three objects: first, to obtain a knowledge of the functions of the different parts of the animal organism; second, to illustrate to physiological students previously-known facts; and third, to enable students to acquire dexterity in surgical operations. The practice of vivisection for the third of these purposes is generally condemned in Great Britain, but is carried on in the veterinary colleges of France, where it is defended on the ground that it is necessary to accustom the students to preserve their coolness at the sight of blood, and to teach them to avoid the risk of injury from the convulsive movements of an animal on which they are operating. Even when practised with the other two objects mentioned vivisection is condemned by a large class of persons as unwarrantable cruelty unless the animal operated on is rendered insensible by some anæsthetic. It is, however, contended that the use of an anæsthetic may in many cases destroy the value of an experiment upon a living animal by materially influencing the phenomena which it is desired to observe, and that vivisection even involving painful operations is absolutely indispensable to the advance of physiological and medical science. At the Liverpool meeting of the British Association in 1870 a committee was

appointed to consider this subject and to report on it. Their report was rendered at the meeting held in the following year at Edinburgh, and was as follows:—

1. No experiment which can be performed under the influence of an anæsthetic ought to be done without it.

2. No painful experiment is justifiable for the mere purpose of illustrating a law or fact already demonstrated; in other words, experimentation without the employment of anæsthetics is not a fitting exhibition for teaching purposes.

3. Whenever, for the investigation of new truth, it is necessary to make a painful experiment, every effort should be made to insure success, in order that the suffering inflicted may not be wasted. For this reason no painful experiment ought to be performed by an unskilled person with insufficient instruments and assistance, or in places not suitable to the purpose; that is to say, anywhere except in physiological and pathological laboratories, under proper regulations.

4. In the scientific preparation for veterinary practice, operations ought not to be performed upon living animals for the mere purpose of obtaining operative dexterity.

In 1876 an act (39 and 40 Vict. cap. lxxvii.) entitled an act to amend the law relating to cruelty to animals was passed with the view of placing restrictions on the practice of vivisection. The act forbids the performing on any living vertebrate animal of any experiment calculated to give pain, unless the experiment be performed by a person holding a conditional licence from a secretary of state, and unless it be performed in a registered place, and on an animal rendered insensible to pain by some anæsthetic. If the operation is of such a nature that the animal is likely to suffer pain after the effect of the anæsthetic has ceased the animal is to be killed before it recovers from the influence of the anæsthetic. There are special restrictions as to painful experiments on dogs, cats, horses, asses, or mules. Experiments on animals are now mostly bacteriological and not physiological, as they were at the time of the passing of the act.

**VIZIER**, a title of honour among the Mohammedan powers. It is an Arabic word, and by the Arabs is pronounced *wezzer*, but the Turks and Persians give the first letter the sound of a *v*. According to its most probable derivation it signifies bearer, namely, of the burden of government. In Turkey there were formerly six members of the divan who bore that title, and who, under the presidency of the grand-vizier, formed a sort of committee of that body, but yet had only a deliberative voice in it, and no vote. The grand-vizier formerly ruled with absolute power as the representative of the sultan in peace and war, but now acts more as the president of a ministry. He is usually styled by the figurative title *aadr-azam* (seat of honour), referring to his place in the divan.

**VLADIMIR**, a town in Russia, capital of the government of same name, on a lofty and wooded bank above the Kliasma, 105 miles north-east of Moscow. It is one of the oldest towns in Russia; and has a cathedral, a theological seminary, considerable manufactures, and a trade in fruit, particularly cherries. From 1157 to 1328 it was the residence of the Russian grand-princes. It was twice sacked in the time of the Tartars (1238 and 1410). Pop. 28,286. — The government has an area of 18,764 square miles, and a pop. (1897) of 1,570,730. It has an undulating surface with a general slope towards the east, and is not very fertile. The drainage is all carried to the Volga by the Oka and its tributary the Kliasma. There are important manufactures of linens and woollens, and several blast-furnaces.

**VLISSINGEN**. See **FLUSHING**.

## VOCAL MUSIC. See MUSIC and VOICE.

**VOICE**, the name given to the result of the production of sound in nearly all higher Vertebrate animals. 'Speech' (which see) is a modification of 'voice.' In man the voice is produced by the *inferior laryngeal ligaments*, or *true vocal cords* (see LARYNX) as they are termed. These cords being attached to the glottis are thrown into vibration by the currents of air which in expiration pass over their edges. That voice essentially resides in these cords has been proved by a variety of experiments. Thus if an opening be made in the wind-pipe *below* the larynx the voice ceases; but an opening made *above* the vocal cords does not interfere with the production of voice. The voice returns when the opening in the wind-pipe is closed. When the nerves (*laryngeal*) which supply the muscles moving the vocal cords are injured voice ceases; and if these nerves be divided on each side the voice wholly disappears. When a current of air is forced upwards through the larynx in the dead subject, to imitate the act of expiration in the living body, vocal sounds are produced. The vocal cords consist of elastic tissue, and through their attachments to the cartilaginous parts of the larynx they can be stretched more or less tightly as occasion requires. The chief structures surrounding the vocal cords and entering into the formation of the larynx or organ of voice are noticed in the article LARYNX. The thyro-arytenoid muscles have perhaps the largest share in placing the vocal cords in a parallel position with one another, and of thus relaxing them. The posterior crico-arytenoid muscles separate the cords and dilate the glottis. In tranquil or ordinary breathing the opening of the glottis is wide and triangular, being narrowest in expiration. In deep inspiration the opening is widely dilated, and becomes of a lozenge-shape; and when voice is produced the vocal cords are seen to be approximated and made parallel whilst they are tightly stretched. The higher the note produced the greater is the tension on the cords; and the range of voice therefore depends on the amount of tension which the cords can undergo. No true sound of voice appears capable of being produced at the under part of the opening of the glottis.

Regarding the compass and application of the voice in speaking and singing physiologists have noted three kinds of sequence. In ordinary speaking a monotonous sequence is observed, the notes having nearly all the same pitch, and the variety of the sounds being due rather to articulation in the mouth than to definite movements of the glottis and vocal cords. A passage from high to low notes, without intervals, forms the second kind of sequence; or the same sequence is observed in the passage from low to high notes. Such a sequence is exemplified in crying and howling both in man and in lower animals. The true *musical* sequence forms the third, each sound in the latter case having a defined number of vibrations; and the successive sounds have vibrations corresponding in relative proportions to the notes of the musical scale. In most singers the voice-compass extends to two or three octaves. The lowest female note is an octave or so higher than the lowest note of the male voice; and the female's highest note is about an octave above that of the male. The compass of both voices taken together is about four octaves, the chief differences residing in the *pitch*, and also in the *timbre*. The male voice admits of division into tenor and bass, and the female into soprano and contralto. The differences between the respective voices in males and females is chiefly in tone, and not so much in pitch, since basses can sometimes attain very high notes and contraltos can frequently rival sopranos in the height of the notes they can take. But on comparing the *timbre* or *quality* of these voices singing the same note

the difference is seen to be very marked. The difference of *pitch* between the male and female voice is due to the length of the vocal cords. These in women and men are as 8 to 2, whilst the difference in *timbre* appears to result from differences in the nature and extent of the walls and cavity of the larynx. In boys the larynx and voice resemble those of the female, after puberty the boy's voice taking on the characteristics of the male sex. In castrated individuals the voice retains its boyish and effeminate characters. In old persons the cartilages of the larynx become ossified and hardened, and this fact, together with the loss of nerve power and the relaxation of the vocal cords, explains the cracked and feeble condition of the voice. *Chest notes* differ from *falsetto notes* in that the former are natural notes produced by the natural voice; but the production of falsetto notes is still an obscure phenomenon. Müller thinks they are formed by vibrations of the inner borders only of the vocal cords; whilst Petrequin and Diday are of opinion that the vocal cords have no share in producing falsetto notes, and that they arise from vibrations of air passing through the aperture of the glottis. Finally it may be noted that the actual *strength* of the voice depends on the degree to which the vocal cords can be made to vibrate, and also in a minor degree on the resonance of the larynx, lungs, and chest generally. See also LARYNX and SPEECH.

## VOLATILE OILS. See OILS.

**VOLCANOES**. The term 'volcanic' is applied to all outward manifestations of subterranean fires; to columns of smoke and vapour rising from rocks; to 'salses' or mud volcanoes; argillaceous cones emitting mud, asphalt, and hydrogen; to hot springs, in which, as in those of Iceland and the Yellowstone region in the Rocky Mountains, the waters under the action of elastic vapours are thrown up in jets to a considerable altitude. Earthquakes also are undoubtedly volcanic in their origin. (See EARTHQUAKES.) Volcanoes may occur as isolated conical mountains, such as Vesuvius, Etna, or the Peak of Teneriffe. They also form various groups or systems of mountains, sometimes arranged in single or double lines extending through hundreds of leagues in length, and all showing that the volcanic agencies do not depend on restricted causes operating near the earth's surface, but that they are great phenomena of deep-seated origin. One remarkable fact in the distribution of volcanoes is their proximity to the sea; in proof of which it is sufficient to state that, out of 323 active volcanoes enumerated by Fuchs as occurring in various parts of the known world, all excepting two or three in America, and about the same number in Central Asia, are within a short distance at least of the ocean. There are certain regions over the whole of which active volcanic vents are distributed at intervals. Throughout the intermediate spaces there is abundant evidence that the subterranean fire is continually at work; for the ground is convulsed from time to time by earthquakes; gaseous vapours, especially carbonic acid gas, are disengaged plentifully from the soil; springs often issue at a very high temperature, and their waters are very commonly impregnated with the same mineral matters which are discharged by volcanoes during eruptions.

Of these great regions that of the Andes is one of the best defined. In Chili an uninterrupted line of volcanoes stretches north from the 46th to the 27th degree of s. lat. The Chilian volcanoes rise up through granitic mountains. Villarica, one of the principal, continues burning without intermission, and is so high that it may be distinguished at the distance of 150 miles. In Peru are several mountains of volcanic origin, and farther north, in Ecuador, in the neighbourhood of Quito, where the Andes





attain their greatest elevation, Tunguragua, Cotopaxi, Antisana, and Pichincha, the three former of which not unfrequently emit flames. Cotopaxi, 19,500 feet in height, is the most elevated of the American volcanoes which have been in activity in recent times. (See COTOPAXI.) Going farther north, volcanoes still continue to be found, and in Guatemala and Nicaragua in Central America there are no less than twenty-five active volcanoes. This great volcanic chain, after having pursued its course for several thousand miles from south to north, turns off in a side direction in Mexico, and is prolonged in a great plateau between the 18th and 22d degrees of south latitude. Five active volcanoes traverse Mexico from west to east; namely, Tuxtla, Orizaba, Popocatepetl, Jorullo, and Colima. Jorullo, which is in the centre of the great plateau, is no less than 40 leagues from the ocean, which shows that the proximity of the sea is not a necessary condition, although certainly a very general characteristic of the position of active volcanoes. Thus it will be seen that volcanoes and earthquakes occur uninterruptedly from Chili to the north of Mexico.

On an equal, if not a still grander scale, is another continuous line of volcanic action, which commences on the north with the Aleutian Isles, passes over to north-eastern Asia, then proceeds southward without interruption throughout a space of between sixty and seventy degrees of latitude, to the Moluccas, and then branches off in different directions both towards the east and the west. The northern extremity of this volcanic region is the Peninsula of Alaska. Thence the line is continued through the Aleutian Islands to Kamtschatka, in the southern extremity of which there are seven active volcanoes. The Kurile chain of isles constitutes the prolongation of the range in a southern direction; the line is then continued to the south-west in the Japanese Islands, where there are active vents. Between the Japanese and Philippine Islands the communication is preserved by several small insular vents. The line is then prolonged through Sangir and the north-eastern extremity of Celebes to the Moluccas. Here a great transverse line may be said to run from east to west. On the west it passes through the whole of Java, where there are thirty-eight large volcanic mountains. In the volcanoes of Sumatra the same linear arrangement is preserved. In this region occurred recently one of the most disastrous volcanic eruptions recorded in history. A volcano in the island of Krakatoa in the Straits of Sunda burst out into violent activity on the 26th August, 1883, and in the course of two days caused the loss of many thousand lives, and devastated not only the other isles in the strait, but also extensive portions of Java and Sumatra. In another direction the volcanic range is prolonged through Borneo, Celebes, Banda, New Guinea; and further eastward in New Britain, New Ireland, and various parts of the Polynesian Archipelago. The Pacific Ocean indeed seems, in equatorial latitudes, to be one vast theatre of igneous action; and its innumerable archipelagoes, such as the New Hebrides, Friendly Islands, and Georgian Islands, are all composed either of coralline limestones or volcanic rocks, with active vents here and there interspersed.

In the Old World the volcanic region extends from east to west for the distance of about 1000 miles, from the Caspian Sea to the Azores, including within its limits the greater part of the Mediterranean and its most prominent peninsulas. From south to north it reaches from about the 35th to the 45th degree of latitude. Its northern boundaries are Caucasus, the Black Sea, the mountains of Thrace, Transylvania, and Hungary,—the Austrian, Tyrolean, and Swiss

Alps,—the Cevennes and Pyrenees, with the mountains which branch off from the Pyrenees westward to the north side of the Tagus. The southern boundaries of the region include the most northern parts of Africa and a portion of the desert of Arabia. Besides the continuous spaces of subterranean disturbance, of which the outline has been given above, there are other disconnected volcanic groups, of which the geographical extent is as yet imperfectly known. Among these may be mentioned Iceland, which belongs perhaps to the same region as the volcano in Jan Mayen's Island. With these also part of the nearest coast of Greenland, which is sometimes shaken by earthquakes, may be connected. The Island of Bourbon belongs to another theatre of volcanic action, of which Madagascar and Mauritius form a part. Respecting the volcanic system of Southern Europe, it may be observed that there is a central tract where the greatest earthquakes prevail, in which rocks are shattered and cities laid in ruins. On each side of this line of greatest commotion there are parallel bands of country where the shocks are less violent. At a still greater distance, as in Northern Italy, there are spaces where the shocks are much rarer and more feeble. Beyond these limits, again, all countries are liable to slight tremors at distant intervals of time, when some great crisis of subterranean movement agitates an adjoining volcanic region; but these may be considered as mere vibrations, propagated mechanically through the external crust of the globe. Some remarkable manifestations of this widely-diffused force are on record. On the day of the great earthquake at Lisbon, 1st November, 1755, Vesuvius became tranquil after having shown signs of commotion. The lakes in Scandinavia, and the hot springs at Töplitz, in Bohemia, were at the same time disturbed. On the Cornwall coast the sea rose to a height of 8 or 10 feet, and the same phenomenon was observed on other parts of the English coast. In Scotland the waters of Loch Lomond, Loch Ness, Loch Katrine, &c., rose above their banks. The sea around the West Indian Islands assumed a black tint, perhaps from a discharge of bitumen. Although the connection between earthquakes and volcanoes is established by undoubted facts, there are instances, which are not so easily accounted for, of shocks occurring in places far remote from all indications of modern igneous action, and, so far as has been observed, not synchronous with similar manifestations in volcanic regions. At Comrie, near Crieff, in Perthshire, there are frequent shocks of earthquake of greater or less intensity. Slight shocks have also been felt in several parts of England, especially in Sussex, and in many other countries far removed from all existing volcanic vents. Vesuvius is the most famous of all burning mountains, and an especially celebrated event in its history was the overwhelming of the cities Herculaneum and Pompeii in A.D. 79. Since then there have been numerous symptoms of activity, the most noted of the more recent eruptions being those of 1779, 1793, 1834, 1847, 1850, 1855, 1867, 1872 (see accompanying plate), 1878, and 1880. One of the eruptions most destructive of life and property occurred in 1902, in the island of Martinique, in the West Indies, Mount Pelée having by a sudden outburst destroyed the town of St. Pierre with most of its inhabitants. Much damage and loss of life was also caused at the same time by eruptions of the Soufrière, in the neighbouring island of St. Vincent. In the nineteenth century several instances of the rise and disappearance of islands owing to volcanic action were observed. One of these occurred in July, 1831, off the south-west coast of Sicily, where a vast agglomeration of volcanic matter arose above the sur-



face of the sea. In August the island attained the height of 200 feet and a diameter of 1670 yards, but by the end of the year it had completely disappeared. While it existed it received the names of Graham Island, Julia, and Ferdinandea. In 1866 small volcanic islands were similarly thrown up at Santorin in the Grecian Archipelago. See SANTORIN, HERCULANEUM, POMPEII, VESUVIUS, ÆTNA, HECLEA, &c.

Various theories have been proposed to account for the immediate cause of volcanic action. Two hypotheses, in particular, have been maintained with equal ingenuity by physicists, the one chemical, the other mechanical. The chemical theory first took a definite shape in the hands of Sir Humphry Davy, who suggested that the phenomena of volcanic action might be accounted for on the supposition that the interior parts of the earth consisted of potassium and sodium, and that violent combustion is produced when water comes into contact with these highly-oxidizable metallic bases. This theory was ultimately relinquished by Davy in favour of the mechanical hypothesis, which rests upon the assumption that the interior of the globe consists of a mass of matter in a state of fusion, causing the evolution of a great body of elastic vapour, expanding and seeking to escape where the least amount of resistance is presented, and manifesting itself in the explosions that accompany an eruption, or in the upheaval of rocks and the production of earthquakes. For the views of Lord Kelvin, Mr. Mallet, and the Rev. O. Fisher on the interior of the earth, see EARTH (INTERNAL HEAT OF) in SUPP. and GEOLOGY (p. 138).

The three essential conditions for the production of volcanic phenomena appear to be: (1) apertures or fissures affording communication with the interior of the earth; (2) highly-heated matter beneath the surface; (3) subterranean water, which, in the form of high-pressure steam, is competent to produce all the crater operations. A mass of lava within a small active crater precisely resembles a boiling fluid. The viscous seething mass of lava contains water entangled in it, and when this rises to the upper part of the column of lava it is relieved from pressure and flashes explosively into steam. This restores equilibrium for a while, during which more steam is being generated, and presently another outburst occurs. The friction of the steam against the rock masses generates enormous quantities of electricity, which appear as flashes of lightning issuing from the column of steam above the crater.

The most characteristic product of a volcano is molten rock or lava. Cooled lava in appearance is very like the slag of our furnaces. As to its chemical composition, all lava is made up of oxides, so that half its weight is oxygen, and of these oxides silica is so far the most abundant (from 40 to 80 per cent of the total mass) that the element silicon forms a quarter of the total weight, and of the remaining quarter something less than half is due to the metal aluminium. Where silica forms over two-thirds of the mass of lava, it is called an acid lava; where the proportion of silica is less, it is a basic lava. The typical acid lava is trachyte, the typical basic lava basalt. Fresh acid lavas are whitish, but basic lavas are usually nearly black in colour, all lavas when weathered taking reddish-brown tints. Under the microscope thin slices of lava reveal great differences. First, we have volcanic glass or obsidian, a lava which has rapidly cooled from a condition of complete fluidity, and which shows nebulous patches scattered through a glassy base. A very high power reveals that these patches are composed of minute crystals, called *microliths* or *crystalites*. Crystals are made up of microliths grouped about certain axes, and a completely amorphous glassy lava may

be converted into a highly-crystalline mass by slowly cooling, thus giving the molecular forces time to act in the grouping of the microliths. Most lavas, when viewed under the microscope, exhibit a glassy paste or ground-mass containing microliths, among which distinct crystals are distributed. Or again, when lavas are consolidated at a great depth beneath the surface, the ground-mass is made up of small crystals, amongst which larger crystals are distributed. And finally, we arrive at the granitic structure, in which the rock is completely made up of large crystals without any ground-mass. One and the same rock may exist in each of these forms, according as it has been cooled slowly or rapidly, at a great depth beneath the surface or near it. Thus, while basalt represents the lava form of one variety of volcanic rock, gabbro is the corresponding granitic or crystallized form, and tachylite (or basalt-glass) its glassy or obsidian form. When examined by high powers of the microscope the crystals of granitic rocks are sometimes seen to contain cavities filled with liquid or gas, or with two liquids and a gas. Sometimes the liquid is water, sometimes a hydrocarbon like the mineral oils which are found in abundance in deep-seated rocks in various parts of the world. Not infrequently the inclosed substance is liquefied carbonic acid, a gas which requires a pressure of nearly 600 lbs. per square inch to liquefy it at the freezing-point of water. All lavas alike, when artificially fused, make glass.

Far more abundant than the lava is the steam which issues from a volcano during eruption, and the rain and mud are more formidable enemies than the lava to the population near a volcano. It was mud and dry ashes, but particularly the former, and not lava, which buried Pompeii and Herculaneum. With the steam a large amount of gases also escapes, the chief being hydrochloric acid, sulphur dioxide, boracic acid, carbonic acid, and sulphuretted hydrogen, as well as free hydrogen and nitrogen, ammonia, and some of the volatile metals, such as arsenic, antimony, and mercury. The yellow coating round a volcanic crater is far more often ferric chloride, formed by the union of the iron of the rocks with the hydrochloric acid emitted from the crater, than sulphur, which it resembles, and for which it is so commonly taken. The materials ejected from volcanoes are not, as many may think, a wholly useless collection of *débris*. On the other hand, much of what is thus thrown out is of considerable commercial value. Of the volatile substances issuing from volcanic vents some are at once deposited when they come into contact with the cool atmosphere; others form new compounds with one another and the constituents of the atmosphere; while others, again, combine with the materials of the surrounding rocks and form fresh chemical compounds with some of their ingredients. The deposits which are thus continually accumulating on the sides and lips of volcanic fissures consist of sulphates, chlorides, sal-ammoniac, sulphur, &c.

Besides the lava, solid substances are thrown up. These may be fragments of the sides of the volcanic fissure, as, for instance, at Vesuvius, which is strewn with bits of limestone, even containing fossils. The 'lava ornaments' so frequently purchased at Naples are made, not from lava, but from bits of limestone, altered somewhat by the heat and compressed steam. The escape of the compressed steam and gases from the boiling lava carries up the clinkery froth which perpetually forms on the surface, and which, when not burst into the tiny fragments called volcanic ash, is known to us as pumice, and is in fact a sponge of glass, a mass of tiny glass bubbles. It is this ash or dust which is so dangerous a product, for it rises

sometimes miles above the mountain, and the air carries it enormous distances, hundreds, and even thousands of miles, or it falls mixed with the condensing steam, and buries whole villages in mud. When masses of half-fluid lava are flung into the air they assume roughly spherical forms, and the superheated water, which they (like all lava) contain in large quantities, attempts to free itself as steam, distending them with bubbles. Such masses are called *hombs*. Often they burst, and the rough cindery fragments are called *scoria*, or, if small, *lapilli*. Volcanic mud, when pressed and formed into a rock, makes the building-stone called *tufa*, so much used in Naples and in ancient Rome. Such rocks of tufa or of stratified scoriae are generally penetrated by hard 'dykes' of solid lava, evidently thrust through the mass in a molten condition when it was soft. Weathered cliffs of stratified volcanic rock show these dykes standing out like buttresses. Volcanic products and effects may be seen and examined in many countries, such as Scotland, where volcanic activity has not been known in historic times. See Judd's *Volcanoes* (1881) and Hull's *Volcanoes* (1892). Illustrations of volcanic phenomena (including geysers, mud and submarine volcanoes, &c.) will be found on the accompanying plate. See also GEYSERS, EARTHQUAKES, &c.

**VOLE** (*Arvicola*), a genus of Rodent Mammalia, closely allied to the Muridae, or Rats and Mice, and included in that family, but distinguished by the enamel of the molar teeth being folded so as to produce the appearance of a double triangle on the crown. The ears are very short and rounded, and the soles of the feet are hairless, whilst the tail is relatively short to what obtains in the Mice. Of this genus the best-known forms are the Water-rat or Water-vole (*A. amphibius*), and the Campagnol, Field-vole, or Short-tailed Field-mouse (*A. agrestis*). The Water-vole attains a total length of 13 inches, the tail making  $4\frac{1}{2}$  inches of this measurement. It breeds twice yearly, and appears to produce five or six young at a birth. Its colour is a pale or chestnut brown, tinted with gray above, and fading into gray on the under parts. The ears are remarkably short. A black variety is common in some localities, as, for instance, the north-east of Scotland. The front teeth are yellow-coloured. The food of the Water-vole appears to consist almost exclusively, if not entirely, of vegetable matter. The Water-vole is often confused with the Brown Rat, which often frequents the same localities. The Field-vole is a small animal of 5 inches in length, erroneously named a field-mouse. (See MOUSE.) In 1876, and again in 1891-92, a plague of these animals visited farms on the borders of England and Scotland, and did much damage to the pasturage. This animal is very prolific, and feeds on vegetable matters. Its colour is reddish-brown above and gray below. Another British species of vole is named the Bank-vole. In its habits it is similar to the Field-vole.

**VOLGA**, a river in Russia, the longest in Europe; and, with exception of the Danube, possessing the greatest body of water. It rises among marshes and small lakes beside the Valdai Hills, in the government of Tver, at an elevation of about 550 feet above sea-level, and falls into the Caspian Sea by many mouths, at Astrakhan. Its basin has an area of about 563,300 square miles, and its entire course, including windings, is about 2200 miles in length, while its fall from source to embouchure is only 630 feet. It flows at first south-east about 90 miles to Zubtsof, thence generally north-east past Tver to Mologa, thence east by south past Yaroslaf, Kostroma, and Nijnei-Novgorod, to the vicinity of Kasan. Here it turns south, flows circuitously s.w. past

Simbirsk and Saratof to Tsaritayn and Sarepta, making a marked eastward bend at Samara, and thence south-east to the Caspian. At Tsaritayn it sends off a branch, the Akhtuba, which flows parallel to the main part of the river, and is connected with it by many cross branches. Its principal affluents are the Oka and Kama, the one joining it from the south-west, the other from the north-east. The Volga is navigable almost from its source, and below Nijnei-Novgorod it floats quite large vessels; but its navigation is impeded by shallows and sand-banks, and in winter by ice. Passenger steamers similar to those of American rivers now ply upon it. By a judicious system of canals it communicates with the Caspian, Baltic, Black, and White Seas. The short railway from Tsaritayn to the river Don has diverted much of the traffic from the lower Volga and the Caspian to the lower Don and the Sea of Azov. The banks of the Volga are fertile, and often well-timbered. The river abounds in fish, particularly sturgeon, carp, and pike of extraordinary size.

**VOLHYNIA**, a government in Russia, bounded north by Grodno and Minsk, east by Kiev, south by Podolia, and west by Austrian Galicia and Poland; area, 27,743 square miles. In the south there are spurs of the Carpathians, but the north is low and largely marshy. The whole drainage is carried to the Dnieper by numerous small streams. The climate is mild, equable, and in general healthy. The soil is almost all remarkably fertile, producing abundant crops of all kinds of grain, particularly wheat of excellent quality. Beet and tobacco are important crops. There are also considerable manufactures. The capital is Jitomir. Pop. (1897), 2,997,902.

**VOLITION.** See WILL.

**VOLOGDA**, a town in Russia, capital of the government of the same name, on the Vologda, in the south-west of the government, in a beautiful district extensively occupied with gardens, 35 miles s.e. of St. Petersburg. It consists chiefly of old wooden houses; with a few stone buildings in the modern style in the chief square, and has manufactures of linen, soap, candles, glass, leather, &c. Pop. (1897), 27,855.—The government is bounded north by the government of Archangel; east by the Ural Mountains; south by Perm, Viatka, Kostroma, and Yaroslaf; and west by Novgorod and Olonetz; area, 155,498 square miles. The surface consists generally of a plateau covered with woods, lakes, and morasses. The drainage mostly belongs to the basin of the Northern Ocean. The great wealth of the government consists in its forests, which, besides timber, furnish charcoal. Pop. (1897), 1,365,587.

**VOLSCI**, an ancient Italian tribe who dwelt in Latium, on both sides of the river Liris (Garigliano). They had a republican government. Their principal city was Corioli, from which Coriolanus derived his surname. After having several times endangered the Roman state, they were conquered and disappeared from history, like the other tribes of Latium (338 B.C.).

**VOLTA**, ALESSANDRO, a celebrated Italian physicist, descended from a respectable family of Como, was born in that place in 1745, and died there in 1827. In 1777 he paid a visit to Switzerland, where he became personally acquainted with Haller at Bern, Voltaire at Ferney, and De Saussure at Geneva. Two treatises, published in 1769 and 1771, in which he gave a description of a new electrical machine, laid the foundation of his fame. In 1774 Volta became rector of the gymnasium in Como and professor of physics. In 1779 he was transferred from Como to Pavia to fill the chair of natural philosophy in the university of that city. Here he occupied himself entirely with electrical

researches. He had previously invented the electrophorus, and his invention of the electroscope was also an important improvement. (See ELECTROSCOPE.) His observations upon the bubbles which arise from stagnant water led him also to some valuable discoveries in regard to gases. The electrical pistol, the eudiometer, the lamp with inflammable air, the electrical condenser, and other inventions, are among his claims to renown. He next turned his attention to some of the atmospherical phenomena, as the nature of hail, &c., and subsequently increased his reputation by the invention of the Voltaic pile (1800). In 1782 he had made a tour through France, Germany, England, and Holland. In 1794 he received the Copleian medal from the Royal Society of London, on account of his paper upon the condenser; and in 1801 his electric apparatus attracted so much notice in France that the first consul invited him to France to give an account of his invention before a commission of the Institute, and when the commissioners made their report, proposed that a gold medal should be awarded the inventor in recognition of his services to science. Further favours showed the respect in which Napoleon held him. He was decorated with the cross of the Legion of Honour and the order of the Iron Crown, and in 1810 was raised to the dignity of senator of Italy, with the title of count. In 1819 he resigned his professorial duties, and retired to his native town. Antinori edited a collection of his works (*Opere di Volta*, Florence 1816, five vols.).

**VOLTAIC ARC**, the flame of incandescent particles of carbon which is caused by the passage of a current of electricity between two pieces of carbon, and which is the source of the electric light. The heat of the voltaic arc is the most intense artificial heat known; by its means platinum may be readily fused. See ELECTRIC LIGHTING.

**VOLTAIC PILE**, Volta's arrangement in a pile of alternate discs of copper and zinc separated by pieces of flannel moistened with salt water or with water acidulated with sulphuric acid. The voltaic pile gives a very small current; but, its circuit being broken, it shows at its extremities electricity of high tension, and it is capable of sending a current through considerable resistances.

**VOLTAIRE**, FRANÇOIS MARIE AROUET, called M. DE, a French *littérateur*, born at Paris (according to the register of the parish of St. André), November 21, 1694; died there May 30, 1778. His father was François Arouet, till 1692 notary at the Châtelet, and his mother Marguerite Daumart, a native of L'oitou. He was destined by his father for the legal profession, but his inclination for literature was so decided that he never seriously entered upon it, and the success of his first tragedy *Oedipe*, which was brought out in 1718, reconciled even his father to his abandonment of law for letters. It is traditionally recorded that this play was finished, and that two cantos of his *Henriade* were written in the Bastille, where he was confined for nearly a year (May, 1717, to April, 1718), on account of certain satirical verses on the regent, the authorship of which was ascribed to him. The success of his tragedy at once made him the fashionable poet of the day, and for the next eight years he resided mainly at Paris, leading a life of gaiety and pleasure, and it must be added of license, in the society of the great, whom he frequently visited also at their country seats. It was about the beginning of this period that he changed his paternal name of Arouet into Voltaire, which latter name is most probably explained as an anagram of Arouet l. j. (*le jeune*—the younger, he having an elder brother). The mode of life just indicated ended with Voltaire in a second imprison-

ment in the Bastille in 1726, the occasion of which was his sending a challenge to the Chevalier Rohan, by whom he had been grossly and shamefully insulted. This second imprisonment lasted no more than a month, and on being liberated Voltaire determined to seek greater liberty in England, where he had been invited by Lord Bolingbroke. His residence in England lasted till 1729, and during it he acquired a certain knowledge of English literature (Shakspeare, Pope, Swift, Addison), and made himself acquainted with the writings of the English free-thinkers, Toland, Tindal, Collins, Shaftesbury, &c. After his return he lived chiefly at Paris till 1734. In the course of this second Parisian residence he raised himself from very moderate circumstances to a condition of affluence, not, however, by literary labour, but by monetary enterprises. He had inherited a small patrimony from his father, and this he had increased by the publication of the *Henriade*, which he had finished and published by subscription in England. The two sums did not make a large capital, but by a few successful speculations, and highly remunerative contracts with the government, he multiplied it many times. From 1734 to 1749 his principal place of residence was at Cirey, in Lorraine, where he lived with the Marchioness du Châtelet, with whom he had become intimate in July, 1733. The death of the marchioness in 1749 deprived him of this retreat, and in the following year he accepted the often repeated invitation of Frederick the Great to come and live at his court at Potsdam. Here he was received with the greatest honour, but the good understanding between him and the king did not last long, and in 1753, after numerous unpleasant scenes, Voltaire quitted the Prussian court. Before returning to France he visited one or two of the minor courts of Germany. At Frankfort Frederick caused him to be detained in order to recover from him a collection of poems by the king containing a number of satires on several princes, some of which Voltaire had maliciously exhibited at the courts he had visited. On re-entering France he remained for a short time at Strasburg, Colmar, and Lyons. Near the end of 1754 he removed to Geneva, and for almost the whole remainder of his life he lived either in Switzerland or close to its borders. In 1760 or 1761 he fixed his residence with his niece Madame Denis at Ferney, in the Pays de Gex, a district that at one time belonged to the counts of Geneva, and from the year 1765 this was his sole place of abode. Under his care the village of Ferney, which in 1758, when the estate in which it lies was acquired by him, contained only forty-nine peasants in a miserably poor condition, became a thriving place, and in 1778 numbered 1200 inhabitants, among whom Voltaire lived almost as a sovereign prince. In this retirement he became known to all Europe as the patriarch of Ferney, and here he received a constant succession of visits from persons of rank and fame, and kept up an immense correspondence, which included in its range most of the crowned heads of Europe. In February, 1778, impelled, no doubt, chiefly by the desire of hearing once more the applause of multitudes, he went up to Paris, where he was hailed by all classes with boundless enthusiasm. But the sudden change in his manner of life had an injurious effect upon his health, and there can be little doubt that his death was hastened by the excitement of the occasion. He was buried at the Abbey of Scellières, between Nogent and Troyes, of which his nephew the Abbé Mignot was commendator. At the revolution his remains were transferred to the Panthéon (1791).

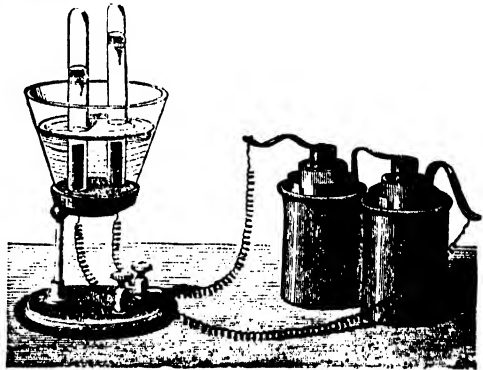
During his whole life Voltaire was an indefatig-

able writer. The long list of his productions embraces works in almost every branch of literature: in poetry, the drama, romance, history, philosophy, criticism, and even science. Nearly all his works are strongly animated by a spirit of hostility to the priests, and the religion they represented. Hatred of fanaticism and superstition was his ruling passion, for it amounted to a passion. For this reason he was almost all his life long in dread of the persecution of the church. Some of the most obnoxious of his works he disowned altogether, and although his repudiation was never believed, yet it served as an excuse to the government to refrain from taking any steps against him. The influence of the clergy was great enough to have him excluded from the Academy on more than one occasion, when he sought admission, and he did not become a member of that body till 1746. It was mainly in order to be out of the reach of the clergy that he lived so much at a distance from Paris on the frontiers of France, whence he could easily make his escape for a while, when he thought it advisable, into Holland or Switzerland. At Cirey and Ferney he could be more outspoken than he had dared to be when he lived chiefly at Paris. From Ferney he issued all his most direct attacks upon Christianity and Catholicism, the *Sermon des cinquante*, *Extrait des sentiments de Jean Meslier*, *La Bible enfin expliquée*, &c. At the same time he was a chief contributor to the *Encyclopédie*, and indeed its leading spirit. Yet he had no sympathy with the atheistical views that are found expressed in some parts of that work. He upheld theism with as much zeal as he denounced Christianity and priestcraft. It ought to be mentioned also that his hatred of fanaticism, although often the cause of violence and injustice on his part, was the mainspring of some of the most honourable actions of his life, as in the case of the Calas family. See CALAS (JEAN).

The works of Voltaire on which his literary fame is now generally held mainly to rest, are his philosophical novels (*Zadig*, *Candide*, *L'ingénu*, &c.), his histories (*Siècle de Louis XIV.*, *Histoire de Charles XII.*), his correspondence, and more than all, perhaps, his poetical epistles, satires, and occasional poems of a light character, in which the typical Frenchman is exhibited in his most complete manifestation, full of wit, gaiety, vivacity, ease, and grace. Several of his tragedies, among which may be mentioned *Zaire* (usually reckoned his master-piece in the dramatic art), *Alzire*, *Mérope*, *Mahomet* (translated into German by Goethe), and *Rome sauvée*, had great success in their own day, but the French do not assign to them a high place in their literature. Voltaire attempted comedy also, but in this he was still less successful. He seems to have been almost entirely deficient in the comic faculty. The best of his comedies is *L'Enfant prodigue*. We should not omit to mention that Voltaire was always a great lover of the drama, and that wherever he settled for any length of time one of his first aims was to get a theatre established in the place, sometimes in his own house. Occasionally he acted himself. The *Henriade*, an epic poem, is another work of Voltaire's, which, though not highly esteemed now, had great success, and exercised a powerful influence when it first appeared. Of the numerous editions of the works of Voltaire, the best are those of Beaumarchais, with introductions and notes by Condorcet (70 vols., 1784-89), Beuchot (72 vols., 1829-41), and Moland (52 vols., 1877-85). The chief biographies are *Desnoiresterres' Voltaire et la Société Française au XVIII<sup>e</sup> Siècle* (8 vols., 2nd ed., 1887); Mahren-

holtz's *Voltaire's Leben und Werke* (2 vols., 1885); Parton's *Life of Voltaire* (2 vols., 1881); Hamley's *Voltaire* (1877); Ballantyne's *Voltaire's Visit to England* (1893); and *Epinause's Voltaire* (1893). See also *Voltaire: sechs Vorträge* by David Strauss (1870); and John Morley's *Voltaire* (1872).

**VOLTAMETER**, an arrangement which shows the quantity of electric current which is passing through its circuit in terms of a quantity of water decomposed. The figure shows the voltameter to the left connected with a battery. A circular vessel has two wires let through its bottom, which bear



inside two pieces of platinum foil as shown; water slightly acidulated with sulphuric acid is poured into the vessel, and two tubes which have been filled with water are placed one over each strip of platinum or electrode. On the poles of the battery being connected with the exterior ends of the wires by means of binding-screws, water will be decomposed, and hydrogen will appear in one tube and oxygen in the other. It will be found, as represented in the figure, that more than twice the quantity of water is displaced in the hydrogen tube than in the oxygen tube. Two volumes exactly of hydrogen and one volume of oxygen are the proper proportions to form water; but some of the liberated oxygen is dissolved by the water.

**VOLTERRA** (anc. *Volaterræ*), a town in Italy, Tuscany, 33 miles south-west of Florence, on a plateau above the left bank of the Era. It was anciently one of the twelve principal cities of Etruria, is still surrounded by Etruscan walls, within which is the modern town, which has a separate inclosure of walls, is defended by a citadel, and entered by five gates. It possesses a museum rich in Etruscan antiquities, mint, and hospital. The manufactures are chiefly articles of alabaster and of salt. Pop. 6000.

**VOLUNTARYISM**, the principle of supporting religion by voluntary association and effort, in opposition to doing so by the aid or patronage of the state.

**VOLUNTEERS**, citizens who of their own accord offer the state their services in a military capacity without the stipulation of a substantial reward. The oldest volunteer force in Great Britain is the Honourable Artillery Company of the city of London, which received its charter of incorporation from Henry VIII. In 1794, and again in 1803, when the ambition and threats of France agitated England, nearly the whole of the available male population was formed into volunteer companies, and the government at one time reckoned upon having nearly 500,000 efficient volunteers in arms. The numbers soon declined, and in 1815 the force almost ceased to exist. About 1857 a feeling of insecurity began to manifest itself in consequence of the alleged insufficiency of the national

defences, and the Victoria Rifles in London and one or two other corps were formed. In a short time the movement began to spread; in May, 1859, the formation of volunteer corps of riflemen commenced under the auspices of government, and by the end of the year many thousands were enrolled. After four years' preliminary experience an act of Parliament relating to the force was passed in 1863; another was passed in 1869, and these, with subsequent acts and regulations, constitute the law relating to volunteers. The volunteer forces comprise Artillery Volunteers, Engineer Volunteers, Rifle Volunteers (by far the most numerous), and the Volunteer Medical Staff Corps (besides the special force of Imperial Yeomanry). In Ireland there are no volunteers. The appointment of all officers is vested in the crown, and they hold their commissions from his majesty. The commissions are prepared in the same manner as those of officers in the regular army; non-commissioned officers are appointed by the officers commanding. The enrolled members are classed as efficient or non-efficient (after their initial training during the first two years), the efficient in rifle battalions being those who have attended at least nine drills during the year, been present at the annual inspection (unless absent on leave), and have made a specified score at the targets. For each efficient government allows to the corps a capitation grant of 35s.; an additional grant of 50s. is made for each officer or sergeant holding a certificate of proficiency. The conditions of efficiency for the artillery, engineers, &c., differ in some details from those applicable to the rifles. Government supplies the arms and a part of practice-ammunition; uniforms, drill-halls, ranges, &c., have to be provided by each corps out of the capitation grant or otherwise. The Volunteer Acts of 1866 and 1900 regulate offers by volunteers for actual military service outside the United Kingdom; and in the South African War a number of volunteers took part with great credit to themselves. Under the territorial system Volunteer battalions are attached to the line regiments of their respective districts, and the new Army Corps scheme of 1901-1902 provides a definite place for them in the district army corps. Increased efficiency, especially as regards summer training in camp, will henceforth be required. The strength of this force has varied considerably in the course of its existence. In 1860 it consisted of 119,146 men; in 1900 the total number of men provided for was 277,623, of whom over 50,000 were artillery volunteers. The state expenditure on the force was estimated at £1,230,000 for 1901-02, while in 1900-01 it was £1,730,000. There are also considerable numbers of volunteers in India, Canada, Australia, &c.

**VOLUTES**, the spiral ornaments of the Ionic and Corinthian capitals. See ARCHITECTURE.

**VOMER**, one of the bones of the skull, forming a single bone placed vertically at the hinder part of the nasal fossæ or nostrils, and forming part of the septum nasi or division between the cavities of the nostrils. Its name is derived from its ploughshare-like shape. It is a thin bone, and articulates with the sphenoid and ethmoid bones, with the two upper jaw-bones, and the two palate-bones. No muscles are attached to the vomer. Its sides are smooth, and grooved for the transmission of blood-vessels.

**VOMITING**, the forcible expulsion of matters from the stomach through the œsophagus or gullet. In vomiting, a deep inspiration is first taken, the glottis is then closed, and the muscles of the abdomen contract strongly and spasmodically. The diaphragm is fixed, and cannot move upwards; and the cardiac or gullet-opening of the stomach is opened, so that

by the contraction of the stomach itself, and by the action of the abdominal muscles, whatever the stomach contains is forced upwards. The abdominal muscles force the stomach towards the upper and back parts of the unyielding diaphragm, against which, as against a fulcrum, the stomach may be pressed. The power of vomiting at will appears to be possessed by some persons, and in the case of persons who have not this power naturally it appears capable of being acquired by habit. Vomiting is a symptom of many diseases and injuries. Many fevers are ushered in, or indicated at their commencement, by vomiting. It may be a symptom of cerebral or brain disorder when unattended by gastric derangement; and persistent vomiting, in the morning generally, is one of the first symptoms of pregnancy. In the latter case it is due to a reflex action, arising from irritation of the *cervix uteri*.

**VONDEL**, JOOST VAN DEN one of the most celebrated poets of Holland, was born at Cologne 17th November, 1587. His parents, who were Anabaptists, removed to Holland while he was a child, and the poet himself afterwards went over to the Arminians, and finally died in the bosom of the Roman Catholic Church, his death taking place on 5th February, 1679. Nature had endowed him with extraordinary talents, and he derived little aid from education. Devoting himself entirely to the cultivation of Dutch poetry, Vondel first learned Latin and French in the thirtieth year of his age. His works display genius and elevated imagination, but the language is often incorrect. They embrace lyric and didactic poems, satires, an epic, and about thirty tragedies, some of which are founded on biblical subjects and bear such titles as Lucifer, Noah, Jephtha, the Gibeonites, &c. These enjoy a high reputation in Holland, and the interspersed choruses may be regarded as the finest lyrical productions of the Dutch muse. The best collective editions of his works are those by Jan van Lennep (twelve vols., 1850-69) and Unger (twenty vols., 1890 onwards). Milton has been accused of borrowing ideas and expressions from Vondel, and a plausible case can be made out.

**VORARLBERG**. See TYROL.

**VORONEJ**, a town of Russia, capital of the government of same name, on a height above the Voronej, near its confluence with the Don, 290 miles s.e. of Moscow. It consists of a high town, a low town, and an extensive suburb—is tolerably well built, and has a cathedral, an episcopal palace, town-house, gymnasium, diocesan seminary, arsenal, hospital, and poorhouse; manufactures of woollen and linen cloth, soap, and vitriol, numerous tanneries, a considerable trade in corn and tallow, and important fairs and markets. Pop. (1897), 84,015. —The government of Voronej has an area of 25,443 square miles, and a pop. (1897) of 2,546,255. It is intersected by the Don, which receives the whole of the drainage, partly through its tributaries, the Voronej and Khoper. The soil is generally fertile, and large crops of grain are raised. The breeding of horses and sheep is an important industry. Manufactures are considerable, and there is an extensive trade.

**VORTICELLÆ**, or 'BELL-ANIMALCULES', a genus of stalked Infusoria (see PROTOZOA), notable for the contractile fibre of the stalk, by means of which they are enabled to contract themselves instantaneously at will. The bell-shaped head or disc is fringed with *cilia*, which are used to create currents in the surrounding water and thus to attract particles of food to the mouth-opening. Reproduction may take place by *fission* or division of the body, by *gemmation* or budding, and also by a peculiar process termed *ency-*

ation, the rationale of which is but imperfectly understood. These animalcules may be found in plenty in summer attached to the stems and leaves of water-plants. They are all of minute and microscopic size. *Vorticella microstoma* and *V. nebulifera* are well-known species of these animalcules.

VOSGES, a chain of mountains about 100 miles long, partly on the frontiers of France and the German territory of Alsace, partly in Alsace, extending from N.W. to S.S.W. nearly parallel with the Rhine, and forming a continuation of the Jura Mountains, which separate France from Switzerland; the breadth varies from 20 to 45 miles. The highest summit, Ballonde-Guebwiller (the summits are generally called *ballons*), has a height of 4685 feet above the surface of the sea. The Vosges mountains have a gentle declivity, and on the eastern and southern sides are often covered with vineyards. Great part of the Vosges is densely wooded, and, besides abounding in game, they possess great mineral wealth, including silver, copper, iron, lead, coal, and antimony. They also contain excellent pasturage; and the inhabitants breed many cattle. The Ill, Lauter, Moselle, Meurthe, Saar, and Saône rise in this chain of mountains.

VOSGES, an eastern department of France, bounded on the north by the departments of Meuse and Meurthe, on the east by Alsace, on the south by the departments of Haute-Saône, and on the west by Haute-Marne; area, 2268 square miles. It derives its name from the mountain-chain which bounds it on the east, and sends out ramifications over the greater part of its surface. Its south portion is traversed east to west by the chain of the Faucilles. In the lower grounds, on an elevated but tolerably flat tract, grain, hemp, flax, and potatoes are extensively raised. The wine produced is indifferent, but the department has long been famous for its *kirch-wasser* made from the produce of extensive cherry-plantations. The principal rivers are the Meuse, Mouzon, Madon, Moselle, Saône, and Meurthe; but none of them are navigable within the department. The minerals include argentiferous lead, copper, iron, antimony, cobalt, marble, millstones, slate, kaolin, and fine agates. The chief manufactures are the famous *Géromé* or Munster cheese, cotton and linen cloth, lace, musical instruments, turnery and wooden clogs, nails, iron, steel and iron ware, paper, leather, pottery, and glass. Épinal is the capital. Pop. in 1896, 419,676; in 1901, 421,114.

VOSS, JOHANN HEINRICH, a celebrated poet and translator, was born in 1751, at Sommersdorf, in Mecklenburg. Till his fourteenth year he was educated in the small town of Penzlin, and then at New Brandenburg. He afterwards acted as tutor in a private family. He early began to write verses, and some of these contributed to the Göttingen *Musen-almanach* led to a correspondence with Boie, upon whose invitation he went in 1772 to Göttingen. Here he studied the classical and modern languages with great zeal, and was one of the founders of the Göttinger Dichterbund. (See GERMANY—Literature.) The editorship of the *Musen-almanach* being handed over to him by Boie, he retired to Wandsbeck in 1775, in order to attend to it in the quietness of the country. He published the *Musen-almanach* up to 1800. In 1777 he married Boie's sister, and next year he was appointed rector at Otterndorf, in Hanover. In 1781, after the publication of several treatises, he produced his German *Odyssey*, a work which has rendered this grand poem national with the Germans. In 1782 he left Otterndorf, and went as rector to Eutin. In 1793 appeared his translation of the *Iliad*, and that of the *Odyssey*, in a new form, in which, however, it did not please so much as before, the former dis-

playing greater truth and naturalness. In 1795 he published an idyl in the epic form called *Luisa*. It had previously appeared in 1783, but was now produced with improvements. In 1799 appeared his translation of the whole of Virgil. In 1801 he added a volume of pastoral poems to a new edition of *Luisa*, and in 1802 four volumes of lyric poems. In 1805 he went as professor to Heidelberg, where he remained till his death 29th March, 1826. Voss rendered good service to the study of classical antiquity, and threw fresh light upon many subjects. As a translator he exhibited wonderful command of language and great skill in the handling of metres. Among his translations that of Homer's works is undoubtedly the greatest; we may also mention, in addition to his Virgil, his Hesiod, Horace, Theocritus, Bion and Moschus, Aristophanes, Tibullus, Propertius, and selections from Ovid. He also undertook with his sons Henry and Abraham a translation of Shakspeare, which was completed in nine vols. in 1829. This translation cannot stand a comparison with Schlegel's.

VOSSIUS, GERHARD JOHANN, a celebrated writer on criticism and philology, born near Heidelberg in 1577, studied at Dordrecht and Leyden. At the age of twenty he commenced his literary career by the publication of a Latin panegyric on Prince Maurice of Nassau, and two years after became director of the college of Dordrecht. In 1614 he undertook the direction of the theological college at Leyden; and, after having occupied that post four years, he procured the appointment of professor of rhetoric and chronology. Having declared himself in favour of the Remonstrants, he became obnoxious to the prevailing party in the church; and at the synod of Tergou, or Gouda, in 1620, he was deprived of his office. Through the influence of Archbishop Laud, the patron of Arminianism in England, Vossius was indemnified for his loss by a prebendal stall at Canterbury, with permission to continue his residence in the Netherlands. In 1633 he was invited to Amsterdam, to occupy the chair of history at the *schola illustris*, and continued there till his death in 1649. Among his numerous works may be specified the treatises *De Origine Idololatriæ*; *De Historicis Græcis*, et *de Historicis Latinis*; *De Poetis Græcis et Latinis*; *De Scientiis Mathematicis*; *De Quatuor Artibus popularibus*; *Historia Pelagiana*; *Institutiones Historice, Grammaticæ, Poeticæ*; *Etymologicon Lingue Latine*; *De Vitiis Sermonis*; *De Philosophorum Sectis*. A collective edition of his works appeared in six vols. folio (Amsterdam, 1695–1701). Several of his sons, especially Isaac, also distinguished themselves as scholars.

VOUSSOIRS, the wedge-shaped stones which form an arch.

VOW, a solemn promise made to perform some act, or to follow out some line of conduct, confirmed by an appeal to the Supreme Being, or supernatural power to favour or to punish the maker of the promise according as he fulfils or breaks such promise. Some vows bind those who make them to perform a certain act out of gratitude for a particular favour, as in the case of Jephthah; others comprehend the performance of certain limited duties during a whole life-time, as the marriage-vow and the sovereign's coronation oath; and others, again, give a particular form to the entire character of a man's life, as the monastic and priestly vows. Among Roman Catholics vows are divided into two kinds:—Solemn, those taken in the face of the church; and simple, those made in private. Bishops are considered to have the power of releasing from simple vows generally; but the power of dispensing in important simple, and in all solemn vows rests with the pope; the five vows



specially reserved for Papal dispensation were: that of absolute and perpetual chastity, entering into a religious order, making a pilgrimage to Rome or Compostella, or of setting out on a crusade. To Protestants the theory of vows appears untenable, as they consider that it is the duty of man at all times to aim at the performance of all the good in his power. See MONASTIC VOWS, ORDERS (RELIGIOUS).

**VOWEL** (from the French *voyelle*; Latin, *vocalis*), a simple articulated sound, which is produced merely by breathing, accompanied by a constriction in the larynx, a greater or less elevation or depression, expansion, and contraction of the tongue, and contraction or expansion of the lips. The vowel sounds of the English alphabet are imperfectly represented by five letters, *a, e, i, o, u* (and sometimes *w* and *y*); the deficiency of our alphabet may therefore be seen at a glance, when we mention that there are at least thirteen distinct shades of vowel-quality in the spoken language as heard in the words, *ate, an, ask, ah, all; dh, err; el, ill; old, ore; pull, ooze*. The long sound of *i*, as in *ire*, and of *y*, as in *by*, although represented by one letter, are really compound vowel sounds or diphthongs. The French simple vowel sounds *u* and *eu*, and the German *ö* and *ü*, are not heard in the English language. See the articles under the several letters.

**VULCANITE.** See **EBONITE**.

**VULCANUS.** See **HEPHÆSTUS**.

**VULGAR FRACTIONS.** See **FRACTION**.

**VULGATE**, the name of the Latin translation of the Bible, which has, in the Catholic Church, official authority, and which the Council of Trent, in their fourth session, in May 27, 1546, declared 'shall be held as authentic in all public lectures, disputations, sermons, and expositions; and that no one shall presume to reject it, under any pretence whatsoever.' Even in the early period of the church a Latin translation of the Bible existed, called *Itala*, the Old Testament made after the Septuagint. This translation was not always accurate, and about 382 A.D. St. Jerome began a revised Latin version of the New Testament, while between 385-405 A.D. he made a new Latin translation of the Old Testament from the Hebrew, which, however, was only partially adopted by the church. In the sequel the translations were combined, and formed the *Vulgate*, so called. That its Latin phraseology is impure, if the Latin of the classical Roman authors is taken as the standard, is not, in all cases, an objection. New ideas require new terms; but the Vulgate does not give, in many passages, the sense of the original, and does not correspond to the present advanced state of philology and archaeology. Many Catholics have often represented the necessity of a new translation, as much of the old one was made when scriptural philology was in a very low state; and all of them admit that the church does not consider the Vulgate as a perfect translation, but only as the most satisfactory of all the Latin editions. Cardinal Bellarmine maintains that all that the Council of Trent says is that the Vulgate contains no errors which affect points of faith or morals: he does not pretend that it is without fault. The Protestants, however, were of opinion that the Vulgate was to be absolutely rejected if they desired to rest their faith on the Bible. But what edition of the Vulgate was to be adopted by the Catholics after the decree mentioned above became a question, because the editions were various, and differed essentially. A committee was appointed to prepare a proper text; but the pope not liking it, it was abandoned. Pius IV., Pius V., and Sixtus V., then took the greatest pains to form a correct Vulgate. The latter published

his edition in 1590, with anathemas against any who should venture to make changes; but this edition had scarcely appeared when Pope Clement VIII. published a new one in 1592, accompanied by a similar bull. Another improved edition was printed in 1593, which has remained as the standard translation of Catholics. The differences in these editions are very considerable. The decree of the council above mentioned gives the list of the canonical books as given in our article **BIBLE**. St. Jerome inserted, it is true, the apocryphal books; but it is clear that he only considered those canonical which are now regarded as such by Protestants.

**VULTURE**, the name given generally to various genera of Raptores or Birds of Prey belonging to the family *Vulturidæ*. This group is distinguished by the possession of a compressed bill; by short tarsi covered with reticulated or net-like scales. The middle toe is longer than the tarsus, and the hinder toe is a little elevated on the tarsus. The claws are blunt. The head and neck are frequently naked or covered with a light down. A large crop exists. The sub-family *Vulturinæ* includes the genera *Vultur*, *Otogygus*, and *Gyps*. The first-mentioned genus, represented by the Arabian or Cinereous Vulture (*V. Arabicus* or *monachus*), is distinguished by the presence of a ruff of feathers, and by the crest borne on the back of the head. The Arabian Vulture inhabits Europe, Asia, and Africa, and is the commonest member of the group. It may attain a length of 3 or 4 feet; its colour being a chocolate-brown; the naked head and neck being blue. A long tuft of feathers springs from the base of the wings. This bird inhabits lofty situations as a rule, and appears to content itself with carrion, but rarely venturing to attack living animals. The genus *Otogygus*—including the *O. calvus*, or Pondicherry Vulture, and the *O. auricularis* or Sociable Vulture—is distinguished from the preceding genus by having a bare head and neck, with long wattles dependent from the ears. The Sociable Vulture inhabits South Africa. It is coloured a general blackish brown, and its average length is 4 feet. The naked head and neck are red. The Pondicherry Vulture inhabits India, and is usually about 3 feet in length. Its head and neck are flesh-coloured, and the chest bears a tuft of white feathers, the plumage generally being dark or blackish-brown. The genus *Gyps* is represented by the Griffin or Fulvous Vulture (*G. fulvus*), and is distinguished by the bill being swollen or distended at the sides, the head and neck being covered with short down, and the neck possessing a ruff of long pointed or downy feathers. The Griffin Vulture inhabits Europe, Asia, and Africa. It attains a length of 4 feet, and is coloured of a general yellowish brown tint, the tail and wing quills being black, and the neck ruff white. The head is covered with white down. The Alpine or Egyptian Vulture (*Neophron percnopterus*) inhabits South Europe, Egypt, and Asia. It is coloured white, the quill-feathers of the wings being dark brown, and the face, bill, and legs yellow. This bird is also known under the designations of 'Pharaoh's Chicken' and 'White Crow,' and is protected by laws from being injured. It belongs to a genus included in the sub-family *Sarcorhamphinae*, in which the bill is long and slender, and the tarsi long, whilst the third toe is usually short and weak. The Condor (*Sarcorhamphus Gryphus*) also represents this sub-family, which also derives its characteristic name from the presence of a fleshy appendage which exists at the base of the bill and on the head. (See **CONDOR**.) The King Vulture (*S. papa*) of Tropical America inhabits the forests, and is coloured a lustrous white on the upper parts, and a pure white below. The wing-pinions



are black, and the neck-ruff is gray. The throat and back of the neck are lemon-coloured, and the crown of the head is scarlet. The bill is orange and black, whilst other tints decorate the head. The Black Vulture or Zoploté (*Catharista Iota*) inhabits the Southern States of America. Its general colour is a dull black. The throat has a yellowish tinge. The length of this bird is about 2 feet. It appears to fly high, and feeds on putrid carrion. The Turkey-

buzzard or Carrion Vulture (*Catharista Aura*) inhabits North America and Jamaica. (See TURKEY-BUZZARD.) The sub-family Gypæstinae is represented by the celebrated Lämmergeier or Bearded Vulture (*Gypæstus barbatus*), a genus and species distinguished from the preceding by the head and neck being feathered, and by the cere being concealed by bristly hairs. See LÄMMERGEIER. See Plates III. and IV. at ORNITHOLOGY.

## W.

W, the twenty-third letter of the English alphabet, representing a sound formed by opening the mouth with a contraction of the lips, and an initial breathing such as is performed in the rapid passage from the vowel sound *u* (*oo*) to that of *i* (*ce*). The English pronunciation of *w* is a peculiarity of that language, though some other languages have a sound coming pretty near it, as *ou* in the French *oui* (pronounced *we*), and the Spanish *hua*, as in *Chihuahua* (pronounced *Chiwōwa*). In the beginning of proper names the French and Spanish generally substitute a *gu* for the original *w* sound: thus *Guillaume* (William), *Guadalquivir* (Arabic, *Wad-al-kebir*, the great river). At the end of words or syllables *w* is either silent, as in *low*, *bow*; or it modifies the preceding vowel, as in *new*, *law*, *how*. In the Welsh language it is employed by itself as a vowel, as in *Bettws* (pronounced *Betws*). In German it has a sound approaching to the English *v*. By the Cookneys *w* is substituted for *v*, and *v* for *w*, with what Webster calls a most amusing perversity. This letter is formed, as its English name indicates, by doubling the *u* or *v* (the latter the only Latin form for the vowel and consonant), and makes its first historical appearance in a document of Clovis III. at the end of the seventh century; it came to be used in England about the middle of the eleventh century, when it was often preceded by an *h*, as in the Anglo-Saxon *hwylc*, which; *hwenne*, when; in such words the letters are now transposed, but the pronunciation yet remains as if they had not been so.

WAAL, a branch of the Rhine. See RHINE.

WABASH, a river of the United States, which rises in the N.W. of Ohio; flows west and south across Indiana, then nearly south between Indiana and Illinois, and falls into the Ohio after a course of 550 miles. It is navigable for steamboats to La Fayette and connects Lake Erie with the Ohio by the Wabash and Erie Canal.

WACE, an Anglo-Norman poet, whose Christian name is generally believed to have been Richard or Robert, a native of Jersey, born about 1115, patronized by Henry II. of England, who made him a canon of Bayeux; died about 1180 or 1184. Two important works by him remain, the *Brut d'Angleterre* (see *Layamon*), and the *Roman de Rou*, a history of Rollo and the dukes of Normandy, including the conquest of England.

WACO, a rising town of the United States, McLennan county, Texas. It is situated on the Brazos River; and as the centre of a large and fertile ranching and wheat-growing district it commands a large and increasing trade in cattle, wheat, and other agricultural products. Pop. (1890), 14,445.

WADAI, or WADAT, an extensive and powerful negro state in the Central Soudan, between Kanem and Bagirmi in the w. and Darfur in the e., with a

population estimated at about 5,000,000. It consists principally of an elevated plateau, very fertile in some parts, producing abundantly maize, millet, indigo, cotton, &c. Ivory and slaves are also largely dealt in. The inhabitants are warlike, and their sultan exercises tributary rights over several neighbouring settlements; but his aggressive policy was somewhat checked by the Mahdi. The latter's troops inflicted a crushing defeat on the Sultan of Wadai's forces in November, 1888. The prevailing religion in this state is Mohammedan. Capital, Abeshe. Wadai is in the French sphere.

WADELAI, a military post in the Equatorial Province of the Egyptian Soudan, on the Nile not far below the Albert Nyanza. It is famous as the chief station of Emin Pasha (Dr. Edward Schnitzer), governor of the province, who, after the Mahdist rising, was cut off from civilization, and who was relieved by Mr. (now Sir) Henry M. Stanley. See AFRICA.

WADHAM COLLEGE, Oxford, a college endowed with estates purchased by Nicholas Wadham, of Merifield, Somersetshire, founded for a warden, fifteen fellows, fifteen scholars, two chaplains, and two clerks, and opened in 1613.

WADING BIRDS (*Grallatores*), an order of birds, distinguished by their elongated legs. See ORNITHOLOGY.

WAFER, in the Roman Catholic Church, a thin and generally circular cake of unleavened bread used in the administration of the Eucharist. They are usually made with a design in relief, representing the crucifixion, the Lamb, the cross, or other sacred symbols, and are of various sizes, the smallest, about 1 inch in diameter, being for the communion of the people.

WAGES, generally speaking, the payment given for personal services, as contradistinguished from money received for anything sold; thus when an author publishes a book, or a shoemaker sells a pair of shoes, the sums received are not wages, although they are to the seller virtually the same thing. The term wages is now usually restricted to the money paid at short intervals (say weekly or fortnightly) for mechanical or muscular labour, the term *salary* being applied to the remuneration of the services of bank, railway, and other managers, overseers and clerks, paid at longer intervals, as quarterly, half-yearly, &c.; and *fee* to money paid for the services of lawyers, doctors, paid at special times according to custom. As to the laws regulating the rise and fall of wages, see the article POLITICAL ECONOMY; and as to the attempts made by labourers themselves to raise the rate of wages, see TRADES UNIONS. (See also CAPITAL, COMMUNISM, LABOUR, TRUCK-SYSTEM.) In law, the attachment of wages is abolished in England by the Wages Attachment Act of 1870;

and the Wages Arrestment Limitation Act of 1870 for Scotland provides that only that portion of the wages of labourers, farm servants, manufacturers, artificers, and workpeople, which is in excess of 20s. per week, shall be liable to arrestment for debt.

WAGNER, WILHELM RICHARD, musical composer, was born at Leipzig, 22d May, 1813. He was educated first at Dresden, and afterwards at the University of Leipzig. While pursuing his studies there he also studied music, and composed his piano sonata in B flat, and a symphony performed in 1832. In 1834 he became conductor of the theatre at Magdeburg, where he produced his now forgotten opera *Das Liebesverbot* (Forbidden Love); acted in the same capacity in 1837 at Königsberg; and in 1839 at Riga, where he wrote the first two acts of *Rienzi*. In the latter year he went to Paris, where, in the midst of many disappointments and privations, he completed *Rienzi* and wrote the whole of *Der Fliegende Holländer* (The Flying Dutchman). *Rienzi* was produced at the Dresden Opera House with such success that the management brought forward *Der Fliegende Holländer* in the following year. This also proved a signal success, and the post of conductor of the Royal Opera was offered him, one of the most important and lucrative musical appointments in Germany. In that position Wagner remained for seven years, during which he composed *Tannhäuser* (first performed in 1845) and *Lohengrin* (completed 1849, produced 1850). In consequence of his active sympathies with the liberal party during the revolutionary period of 1848 he was compelled to leave Dresden and take refuge in Zürich. Here he partly composed his great tetralogy *Der Ring des Nibelungen* (the Ring of the Nibelungs). Here also he wrote his two most important theoretical works, *Opera and Drama*, and *The Work of Art of the Future*. In 1855 he accepted the conductorship of the concerts of the Philharmonic Society of London, which he held for one season only, his method of conducting an orchestra being at variance with English tradition, and, therefore, violently condemned by the press. In 1859 the music to *Tristan und Isolde* was completed, and towards the end of that year Wagner went to Paris. Here in 1861 *Tannhäuser* was produced at the Grand Opéra, and was hissed off the stage. In 1864 Wagner was invited to Munich by King Ludwig of Bavaria, who remained his steady friend and patron to the last. At Munich *Tristan und Isolde* was produced in 1865, and *Die Meistersinger von Nürnberg* in 1868—both with brilliant success. It was mainly the assistance of King Ludwig which enabled Wagner to realize the boldest dream of his life, the performance of the Ring of the Nibelungs at a theatre erected for the purpose at Bayreuth, an event which took place in the summer of 1876, before an audience including the Emperor of Germany and many of the leading artists from all parts of the world. In 1877 he again visited London, and conducted a series of concerts at the Albert Hall. In the summer of 1883 was produced *Parsifal*, his last opera, at Bayreuth, some months, however, after its great composer's death, which took place at Venice, 13th February, 1883. It is claimed for Wagner that he has abolished, as far as opera is concerned, the entire apparatus of absolute musical form, bringing about the relinquishment of set aria, duet, trio, quartet, &c., which are so often dragged in to tickle the ear and to form mere opportunities for the leading vocalists, in defiance of the dramatic action; and he has put into its place another form, inspired by poetry alone, and founded upon the necessities of the dramatic purpose. The poetry of his operas he wrote himself, and as a literary work it is infinitely superior to the vapid libretti so common before his time. See *OPERA*.

WAGON, a four-wheeled vehicle for the transport of goods or passengers, drawn generally by horses or a steam-engine. Horse-wagons are furnished, according to the number of horses to be yoked in them, with either one or two pairs of shafts, and as these bear no part of the weight they are hooked or hinged to the body of the wagon, so that they can be raised or lowered at pleasure. To enable the vehicle to turn as quickly and in as little space as possible, the fore pair of wheels are often made smaller than the hind pair, and to increase this advantage still further the axle of the fore-wheels is frequently fixed to the bottom of the vehicle by a swivel joint, in which case the shafts are attached to the fore axle. The framework of the wagon is usually mounted on springs. As to the comparative advantages of the two-wheeled cart, in which the horse has to carry as well as draw the weight, and the wagon, in which he has merely to draw, various opinions prevail.

WAGRAM, a village of Lower Austria, on the left bank of the Russbach, 12 miles N.E. of Vienna, famous for the great battle between the French under Napoleon and the Austrians under the Archduke Charles, on the 5th and 6th July, 1809. Napoleon had obtained reinforcements after the severe loss which he sustained at Aspern and Essling, and was able to throw an army of 150,000, with 550 cannon, across the Danube on the 5th July. The Austrians, who occupied a strong position at Wagram, were immediately attacked, but the first day with little success. On the following morning the archduke fell upon the French centre under Masséna, and then upon their left, producing confusion ending in total rout. A successful attack upon the Austrian left and centre by Davoust and MacDonald compelled the archduke to retreat, which he did leisurely and in good order, carrying with him about 7000 prisoners, but leaving behind him 25,000 dead and wounded on the field, the French loss being probably about equal. On the 12th an armistice was signed at Znaim, and negotiations were commenced for a peace, which was concluded on the 14th October at Schönbrunn, and by which Austria ceded all her seacoast to France; Bavaria and Saxony were enlarged at her expense; part of Poland in Galicia was given to Russia, and Joseph Bonaparte was acknowledged king of Spain.

WAGTAIL, the name applied to a certain number of insectorial birds belonging to the warbler family, from their well-known habit of jerking their long tails when running or perching. These birds inhabit meadow-lands and pastures, and frequent pools and streams. They are agile runners, and have a rapid flight. The food consists of insects. Their nests, built on the ground, contain from four to six eggs. These birds belong to both Old and New Worlds, and migrate southwards in winter. The best-known example of the British Wagtails is the Pied Wagtail (*Motacilla Yarellii*), a permanent resident in Britain. Its colour is almost wholly black and white, the former colour predominating on the top of the head, neck, throat, shoulders, upper tail, and wing-coverts. The under parts are grayish-white. The average length is 7 or 8 inches. The eggs number four or five, and are coloured grayish-white, speckled with brown. Britain, Norway, and Sweden are the countries in which it is chiefly found. The White Wagtail (*M. alba*) has often been regarded as a mere variety of the preceding species. This species is common in France and Southern Europe, but it is only an occasional visitant to Great Britain. It resembles the preceding species, but is rather slenderer in form than it, and has the throat and part of the head and neck

alone black, the general colour of the upper parts being of a light ash gray. As the Pied Wagtail assumes a gray colour on the back in winter, the birds much more closely resemble each other at that season. The Gray Wagtail (*M. campestris* or *Boarula*), and the yellow species (*M. sulphurea* or *Budytes Rayi*), or Ray's Wagtail, as it is also named, are equally typical representatives of the sub-family. The gray species is a migratory British bird, of a slate-gray colour above, the wing coverts, quill feathers and six central feathers of the tail being black; the throat is black, and the under surface bright yellow. The Yellow Wagtail, or Ray's Wagtail, is coloured olive on the upper and yellow on the under parts, with white, brown, and black markings. The genus *Ephthianura*, of which *E. albigrons* of Australia is a familiar species, is an allied genus to *Motacilla*. The male has a white throat and a black band on the chest; and the tail is shorter than in the English species. The Pipits or Titlarks (*Anthus*) are also included in the sub-family Motacillinae.

WAH. See PANDA.

WAHABEES, WAHABIS, or WAHABITES, a Mohammedan sect, founded in Arabia about the middle of the eighteenth century by Abd-el-Wahab, an oriental scholar of high attainments, who could not help observing the corruption both of doctrine and in practice prevalent among the professed sons of Islam, especially the Turks. He deemed it his mission, not to teach a new religion, but to purge the innovations and errors which had crept into the old faith, and to restore the doctrines and observances to strict harmony with the teachings of the Koran and the Sunna. He inveighed against the idolatrous veneration for the Prophet and other saints, denying the intercession of saints altogether. He was an enemy to the gaudy decorations of the mosques and the rich dresses worn by the Turks, and strictly prohibited the use of tobacco. All who should oppose this reformation were to be destroyed by fire and sword. The first of Abd-el-Wahab's important converts was the young and ardent chief Sa'ud (or Saoud), who ruled over the little territory surrounding the fortified town of Deraayah (or Dureeyeh), and who afterwards became the son-in-law of the reformer. Abd-el-Aziz and Ibn Sa'ud, the son and grandson of this chief, carried their arms to the utmost limits of the Arabian peninsula, subjugating and converting numerous tribes of Bedouins, and plundering the treasures of the mosques. The province of Nejed became the chief seat of their power, but Sa'ud II. soon extended it over the greater part of Arabia, over which he administered justice in the manner of the caliphs. In 1803 he captured Mecca, and soon conquered Hejaz. The loss of the sacred city at last roused the Turks to action, and Mehemet Ali, pasha of Egypt, was appointed in 1804 to the task of crushing the fanatics. Nothing of importance, however, was done till 1812, when the Egyptians took Medina and drove the Wahabees out of Hejaz. In 1815 Ibrahim Pasha undertook an expedition into Central Arabia to crush the power of the sect at once and for ever; but it was not until 1818, after much hard fighting, that he fairly succeeded in dispersing the Wahabee forces and taking their capital, Deraayah, which he laid in ruins. Abdalla, the son and successor of Sa'ud, and some of his ministers, were made prisoners, and sent off to Constantinople, where they were executed. The Egyptians were not able to maintain the supremacy which they had acquired; gradually the Wahabees regained their influence in the centre of the peninsula; and soon after the death of Mehemet Ali, in 1849, the Egyptians gave up the struggle. For many years no reliable information

respecting the condition of the sect reached Europe; but it was at last learned from the accounts of Pelly, who visited them in 1863, and of Colonel Pelly in 1865, that the Wahabees, under the rule of Feysul, at once their emir (temporal ruler) and imaum (spiritual chief), extended their sway over a wider territory than ever before, and threatened to control by their arms and influence the whole peninsula. Since 1870, however, owing to internal dissensions and the active hostilities of the Turks, their power has been on the decline, yet they have many active partisans and missionaries in the principal towns. Numerous fanatical Mohammedan bodies, evidently allied to the Wahabees, have settled in India, and by their turbulence and conspiracies have caused great uneasiness to the British government.

WAHLSTATT, a large village in Silesia, near Liegnitz, on the Katzbach, on the site of which Henry II., duke of Silesia, fought a bloody battle, April 9, 1241, against the Mongols, in which, although he lost his life and the latter were victorious, the torrent of invasion was checked. In memory of this battle a chapel was erected, and gradually a village grew round it, which received the name of Wahlstatt (Battle-place). In the neighbourhood Blücher was victorious over the French, August 26, 1813 (see KATZBACH), and in reward of this and other victories was made Prince of Wahlstatt.

WAIFS, in English law, goods found to which nobody lays claim; also goods thrown away by a thief when pursued, to prevent apprehension. Such goods belong to the crown unless the owner takes the necessary steps for prosecuting and convicting the thief.

WAINSCOT, the name given to boards employed to line the internal walls of an apartment. Waincoting, both of Flemish and English oak, was commonly used for interior linings in Elizabethan and Stuart times.

WAITS, the name given at one time to the king's minstrels, whose duty it was to guard the streets at night and proclaim the hour. In the province the name was afterwards applied to the town's musicians, who, however, did not perform the duties of watchmen; and to private bands, when employed as serenaders. At present the waits are musicians who play during the night hours on the approach of the Christmas or New-year seasons, and call at the houses of the inhabitants for donations.

WAKE, a term corresponding originally to *vigil*, and applied to an annual festival held on the anniversary of the day on which the parish church was consecrated and dedicated to a saint, the celebration being begun on the preceding day (the eve or vigil). On the eve of the anniversary the parishioners attended service in the church, the floor of which was strewn with flowers and rushes, and the altar and pulpit were decorated with boughs. Tents were planted in the churchyard to supply the people from surrounding parishes who crowded in on the morrow, that day being observed as a holiday. They soon degenerated into mere country fairs, and were long characterized by wild riot and licentiousness. Statutes were at various times directed against holding markets in churchyards and showing all goods except necessary refreshments on the great church festivals, but they seem to have been little regarded. Country wakes on some saints' festivals are still kept up in certain English parishes. A *lyke* or *liche wake* (Anglo-Saxon, *lic*, a corpse) is the watching of a dead body by night by the relatives and friends of the deceased. The custom arose no doubt from the dread of remaining alone all night in the presence of the dead or from the fear that malignant spirits would interfere with the corpse. The practice, once general, is now

confined to the lower Irish classes, and as the watchers are frequently freely supplied with liquor, scenes much out of keeping with the sad occasion occur.

**WAKE, WILLIAM**, Archbishop of Canterbury, was born at Blandford, in Dorset, on Jan. 26, 1657. From Blandford grammar-school he proceeded to Christ Church, Oxford, where he graduated B.A. in 1676. After ordination he received the appointment of chaplain to Lord Preston, the English ambassador in Paris, and in 1688 he became preacher at Gray's Inn. In 1689 he was appointed deputy clerk of the closet and chaplain in ordinary to William and Mary, and in that year also he received a canonry of Christ Church, Oxford. From 1693 till 1706 he was rector of St. James's, Westminster, he became canon residentiary and dean of Exeter in 1703, from 1705 to 1716 he was bishop of Lincoln, and from 1716 till his death on Jan. 24, 1737, he was archbishop of Canterbury. He took part in negotiations during 1717–20 for the union of the Anglican and the Gallican churches, and in his relations with Nonconformists he always showed a liberal spirit. His chief works are: *The State of the Church and Clergy of England in their Councils, Synods, Convocations, Conventions, and their other Assemblies, historically deduced* (1703); *The Genuine Epistles of the Apostolical Fathers* (1693); and *Principles of the Christian Religion in a Commentary on the Church Catechism*.

**WAKEFIELD**, an episcopal city, parliamentary and municipal borough of England, in Yorkshire (West Riding), on the river Calder, 9 miles south by east of Leeds. The river is here crossed by a bridge of ancient date. The most noteworthy building of Wakefield is the cathedral of All Saints, mainly in the Perpendicular style, with a lofty tower and spire, though including work of earlier and later dates. The vestry dates from 1881, and the episcopal throne from 1888. The other places of worship in town include: St. Mary's Chantry, on the bridge, a decorated structure of the time of Edward III., restored in 1847; the modern churches of St. John's, St. Andrew's, St. Mary's, St. Michael's, and Trinity ecclesiastical parishes; and chapels for Congregationalists, Baptists, Wesleyans, Unitarians, and other Nonconformist bodies. The other chief buildings and institutions of the town include: the town-hall, a fine building in French Renaissance style; a large corn-exchange; a market-house, an industrial and fine art institution (1890), containing a museum, laboratory, and lecture-room; the post-office; public baths; mechanics' institute; church institution and library; West Riding sessions-house; a grammar-school founded in the sixteenth century; a high-class school for girls; a prison; a hospital; a lunatic asylum for the West Riding; and almshouses and charities. The industrial establishments comprise woollen-mills, soap and artificial-manure works, iron-foundries, boiler-works, agricultural-implement manufactories, wire-rope works, machine-works, corn-mills, malting-works, breweries, &c. There are many collieries near the town, and market-gardening is carried on in the vicinity. The trade, especially in corn, is very extensive, and is facilitated by railway connections as well as by the river Calder and canals. Wakefield is mentioned in Domesday Book. It was the scene of a Yorkist defeat in the Wars of the Roses on Dec. 31, 1460. In 1832 it was made a parliamentary borough, and since then it has returned one member to the House of Commons. In 1888 it was made the seat of a bishopric, formed mostly out of the diocese of Ripon. Pop. of municipal borough in 1891, 33,146; in 1901, 41,544;

of parliamentary borough in 1891, 37,269; in 1901, 41,189.

**WAKEFIELD, EDWARD GIBSON**, colonial statesman, was born in London on March 20, 1796. Educated at Westminster School and Edinburgh High School, he became associated in a subordinate capacity with the legations at Turin and Paris. In 1826 he induced a young lady by false pretences to be married to him at Gretna Green, and he had in consequence to undergo three years' imprisonment. During this period of restraint he turned his attention to colonial affairs and worked out the scheme of colonization usually known by his name. Its cardinal features were the abolition of free grants of land for agricultural purposes, and the careful control of emigration. The National Colonization Society was founded in 1830 to carry out his ideas, and in the following year his plan was adopted by the government for New South Wales. The South Australian Association was formed in 1834, and included many eminent men, and under its auspices the colony of South Australia was founded in 1836 on Wakefield's principles. He accompanied Lord Durham to Canada in 1838 as adviser, and he had an important share in drawing up the report in which Durham embodied his proposals for settling the Canadian difficulty. Wakefield was the moving spirit behind the New Zealand Association of 1837, which forced the British government to annex New Zealand. He was subsequently a prime mover in founding the Anglican settlement in New Zealand, and in 1852 he went to New Zealand and plunged into colonial politics. After the breakdown of his health in 1854 he lived in retirement till his death, which occurred at Wellington, New Zealand, on May 16, 1862.

**WAKEFIELD, GILBERT**, scholar and controversialist, son of an Anglican clergyman, was born in Nottingham on Feb. 22, 1756. After receiving his school education in his native city and at Kingston-on-Thames, he entered Jesus College, Cambridge, in 1772. He graduated as second wrangler and with the highest classical honours in 1776, and was elected a fellow of his college. Ordained in 1778, he served curacies in Stockport and Liverpool, but in 1779 he left the Anglican body because he had come to hold views of a semi-Arian or Unitarian type. He was classical tutor in the famous free theological academy at Warrington from 1779 till its dissolution four years later, and in 1790–91 he held a similar post in the dissenting college at Hackney. His reply to a party pamphlet by Bishop Watson of Llandaff led to a prosecution for seditious libel, and he was imprisoned in Dorchester jail during the two years 1799–1801. He died at Hackney, soon after his release, on Sept. 9, 1801. Wakefield's contributions to scholarship comprise editions of Virgil's *Georgics* (1788); Horace (1794); Moschus (1795); and especially of Lucretius (three vols., 1796–99); a translation of the New Testament; *Tragediarum Dilectus* (1794), containing several works of the three great Greek dramatists; and *Silva Critica* (1789–95), his chief work, in which he sought to illustrate the Scriptures 'by light borrowed from the philology of Greece and Rome'. He also wrote: *Essay on Inspiration* (1781); *The Internal Evidence of the Christian Religion* (1789); *Inquiry into the Expediency and Propriety of Public or Social Worship* (1791), in which he states his reasons for objecting to public worship; *Evidences of Christianity* (1793); *The Spirit of Christianity compared with the Spirit of the Times* (1794); *Reply to Paine's Age of Reason* (1795); and *Noctes Carcerariæ* (1801), on Greek metres. Wakefield was a pioneer of the liberal

movement in theology and religion, and in him, as in many others of his time, religious liberalism was associated with political radicalism, especially with opposition to the policy of Pitt and with admiration for the French revolution. He was a friend and correspondent of Fox.

**WALACHIA.** See **ROUMANIA**.

**WALCHEREN**, an island of Holland, in the province of Zeeland, at the mouth of the Scheldt, forming an irregularly-shaped circle of about 11 miles in diameter. It is a fine island, in some parts well wooded, but generally consisting of fertile meadow lands, yielding corn and other crops in great plenty. Fruit is abundant. The inhabitants are chiefly engaged in agriculture. It contains the towns of Flushing, Middelburg (the capital), and Veere. It is protected from the sea by strong dykes, which have frequently been broken through. The Walcheren expedition of 1809 is one of the most complete failures in British military history. The second Earl of Chatham, eldest son of the great Chatham, was despatched to the island in command of a force of about forty thousand for the purpose of capturing Antwerp and destroying Napoleon's arsenals on the Scheldt. He was to be supported by a fleet of thirty-five ships of the line and many other vessels under the command of Sir Richard John Strachan. On July 29 he landed part of his force on the island and soon occupied Middelburg, while other parts of the army took possession of other fortresses about the mouth of the river. Instead, however, of pressing forward against Antwerp, he persisted in the siege of Flushing, which was captured on Aug. 16, and so allowed the greater part to be strongly fortified. In September he returned home with the bulk of his force, leaving a garrison of fifteen thousand on the island of Walcheren. The garrison was soon attacked by fever and other diseases, about one-half being stricken down. Orders were then received from the government to destroy Flushing and return home.

**WALDECK**, a principality of the German Empire, consisting of two distinct portions, Waldeck proper and Pyrmont. Waldeck proper, with an area of 407 square miles, is inclosed by the Prussian provinces of Westphalia and Hesse-Nassau, and Pyrmont, with an area of 25 square miles, is inclosed by Prussia, Brunswick, and Lippe. Both sections are mountainous, and belong to the basin of the river Weser. Waldeck proper is nowhere much under 600 feet above sea-level, and in the western region, known as Upland, it attains in the Ettelsberg an elevation of 2726 feet. Much of the soil is not suited for agriculture, but some parts, such as the lower valley of the Eder and the north-east of Waldeck proper, are fairly fertile. The chief industries are agriculture and the rearing of cattle, sheep, pigs, and other animals. Manufactures are of small extent: the most important are tobacco and cigars (Pyrmont), liqueurs (Arolsen), and machines (Wetterburg). There are ironstone mines at Adorf. The constitution bears date August 17, 1852. The princely dignity is hereditary according to primogeniture in the male line, but on the extinction of the male line it falls to the female line. The Diet consists of fifteen members elected indirectly for three years. By the Treaty of Accession of 1867, renewed in 1877 and 1887, the internal administration is carried on by a *Landesdirektor* appointed by the Prussian government with the approval of the prince. Its courts of justice are subject to those of Cassel and Hanover, and its troops form a battalion of a Prussian infantry regiment. Arolsen is the capital and residential town. The Reformation was introduced under Count

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Philip IV. in 1526. The imperial field-marshal, George Frederick (1664-92), was the first of its rulers to assume the style of prince. In 1712 the ruler Anton Ulrich was created a prince of the empire. Waldeck supported Prussia in the war of 1866, and entered the North German Confederation in the following year. The Treaty of Accession of 1867, which makes the prince a merely nominal sovereign, was the result of a desire expressed by the diet for union with Prussia. Pop. (1895), 57,766; (1900), 57,918, of whom 8636 are in Pyrmont. The inhabitants are nearly all Lutherans.

**WALDENSES.** This Christian sect owes its origin and name to Peter Waldus (Waldo), a rich citizen of Lyons, although some of their writers derive the appellation Waldenses from *vallée* (valley), and call them *Vaudois*, or dwellers in the valleys, whilst others have traced their origin to the earlier sects of Henricians and Cathari. About 1170 Waldo, from reading the Bible and some passages from the fathers of the church, which he caused to be translated into his native tongue, came to the determination to imitate the mode of life of the apostles and primitive Christians, gave his goods to the poor, and by his preaching collected numerous followers, chiefly from the class of artisans, who, from the place of their birth, were denominated *Leonists*, or the poor of Lyons; *Sabatati* or *Insabatati*, on account of their wooden shoes or sandals (*sabots*); *Humiliatists*, on account of their humility; and were often confounded with the Cathari, Patarenes, Albigenses, and others, whose fate they shared. Their chief strongholds were, and still are, in the mountain tract of the Cottian Alps, south-west of Turin. In their contempt of the degenerate clergy and their opposition to the Roman priesthood the Waldenses resembled other sects of the Middle Ages; but, going beyond the design of their founder, which was merely to improve the morals of the clergy and preach the word of God freely to every one in his native language, they made the Bible alone the rule of their faith, and, rejecting whatever was not founded on it and conformable to apostolical antiquity, they gave a great impulse to a reform of the whole Christian Church, renounced entirely the doctrines, usages, and traditions of the Roman Church, and formed a separate religious society. They were therefore excommunicated as heretics at the Council of Verona in 1184, though Waldo had received a certain amount of encouragement from the Pope Alexander III; but they did not suffer a general persecution until the war against the Albigenses, after they had spread and established themselves in the south of France, under the protection of the Counts of Toulouse and Foix. At that time (1209-30) many Waldenses fled to Arragon, Savoy, and Piedmont. In Languedoc they were able to maintain themselves till 1330; in Provence, under severe oppression, till 1545, when the parliament at Aix caused them to be exterminated in the most cruel manner; still longer in Dauphiny; and not till the war of the Cevennes were the last Waldenses expelled from France. In the middle of the fourteenth century single congregations of this sect went to Calabria and Apulia, where they were soon suppressed; others to Bohemia, where they were called *Grubenheimer*, because they used to conceal themselves in caverns. They soon became amalgamated with the Hussites; and from them the Bohemian Brethren derive the apostolical consecration of their bishops. Their doctrines rest solely on the gospel, which, with some catechisms, they have in their old dialect, consisting of a mixture of French and Italian. In this language their simple worship was performed till their old *Barbes* (uncles, teachers) became extinct

in 1608. They then received preachers from France, and since that time their preaching has been in French. These teachers, however, form no distinct priesthood, and are supplied from the academies of the Calvinistic churches. Their rites are limited to baptism and the Lord's supper, respecting which they adopt the notions of Calvin. The constitution of their congregations, which are chiefly employed in the cultivation of vineyards and in the breeding of cattle, and which are connected by yearly synods, is republican. Each congregation is superintended by a consistory composed of elders and deacons, under the presidency of the pastor, which maintains the strictest moral discipline, and adjusts small differences. From the time of their origin the Waldenses have been distinguished as a separate community by their pure morals and their industry, and have been esteemed as the best subjects. After they had entered into a religious communion with the Calvinists, in the sixteenth century, they were also exposed to the storm which was intended to sweep away the Reformation. This was the cause of their extirpation in France and their chequered fate in Piedmont. Those who had settled in the Marquisate of Saluzzo were totally exterminated by 1633; and those in the other valleys, having received from the court of Turin in 1654 new assurances of religious freedom, were treacherously attacked in 1655 by monks and soldiers, treated with brutal cruelty, and many shamefully murdered. The rest of their male population took up arms; and their bravery, aided by the mediation of the Protestant powers, finally procured them a new, though more limited, ratification of their freedom by the treaty concluded at Pinerolo, August 18, 1655. New oppressions in 1664 gave rise to a new contest and treaty. The persecution exercised in 1685 through French influence obliged thousands to emigrate into Protestant countries. In London they united with the French Huguenots; in the Netherlands with the Walloons; in Berlin with the French congregations; nearly 2000 went to Switzerland. Some of these returned by force to Piedmont in 1689, and with those who had remained maintained themselves under many oppressions, to which limits were finally put in 1725 in consequence of Prussian mediation.

The Waldenses were not permitted to enjoy full religious freedom and civil rights until the establishment of the Kingdom of Italy, but now they do so not merely in their old valleys of Lucerne, Perna, and St. Martin, but generally throughout Italy, and they have churches in Turin, Rome, Venice, &c. Their church service is under the direction of a synod. After long negotiations, in the way of which great difficulties were thrown by the religious zeal of the Tübingen theologians, several hundreds of the above-mentioned fugitives settled in Württemberg in 1699, where their descendants now form several parishes. They are next to the Calvinists in the simplicity of their worship and in their ecclesiastical constitution, but in intellectual cultivation they are behind the other Protestants. See Comba's History of the Waldenses in Italy (Eng. trans., 1892); Melia's Origin, Persecution, and Doctrines of the Waldenses (1870); &c.

**WALDHEIMIA**, a well-known representative genus of Brachiopoda (see MOLLUSCA), belonging to the family Terebratulidæ, in which the shell is minutely punctate, the ventral valve or lower shell being perforated for the emission of a flexible muscular stalk or *peduncle*, by means of which the shell is attached to fixed objects. This genus possesses very long *loops* in the dorsal valve for the attachment of the 'arms.'

**WALES**, a principality in the south-west of the

Island of Great Britain, which gives the title of Prince of Wales to the heir-apparent of the British crown, and has an area of 4,779,325 acres, or 7468 square miles. It is divided into twelve counties, for the names and areas of which see the article BRITAIN. It is composed of a peninsula, with the Island of Anglesey situated at its north-west extremity, and separated from it by the Menai Strait, now crossed by two very remarkable bridges, and with a number of smaller islands chiefly at a short distance from the south-west coast. The peninsula, washed north and west by the Irish Sea, and south by Bristol Channel, and bounded west by the four English counties, Cheshire, Shropshire, Hereford, and Monmouth, is 185 miles long; where widest 95 miles, and where narrowest only 35 miles broad. It is very mountainous, particularly in the north division, where Snowdon, the culminating point of South Britain, rises to the height of 3571 feet; is intersected by beautiful valleys, traversed by numerous streams, including among others the Severn, which has its source within it; and is rich in minerals, particularly copper in the north, and coal and iron partially there also, but much more extensively in the south. The Silurian formation, so called after the Silures, the ancient inhabitants of the principality, covers more than two-thirds of the whole surface, extending continuously from the mouth of the Conway to the vicinity of St. David's Head; but is succeeded in the south by the old red sandstone, above which lies, first the mountain-limestone, and then the large and valuable coal-field already mentioned. Besides the Severn, already mentioned, the principal rivers are the Dee, which has part of its lower course in Cheshire; the Clwyd, in Denbigh and Flint; the Conway, forming the boundary between Denbigh and Carnarvon; the Dovey, and the united Rheidol and Ystwith, which have their mouths near the centre of Cardigan Bay; the Teify, separating Cardigan on the north from Carmarthen and Pembroke on the south; the Cleddy and Cleddeu, remarkable chiefly from contributing, by their junction, to form the splendid estuary of Milford Haven; the Towy and Bury, which both fall into Carmarthen Bay; the Elwy and Taf, which have a common estuary in Bristol Channel; the Romney, which forms part of the boundary between Wales and England; and the Usk and Wye, which, though rising in the principality, have only the earlier part of their course within it. The lakes are numerous, but the largest, that of Bala, is only 4 miles long, and scarcely 1 mile broad. The climate is on the whole moderate and equable, though somewhat keen in the loftier districts. In all the counties, but more especially in the maritime, humidity is in excess, the average fall of rain in the principality being 34 inches, while that in England is only 22. Hence both climate and surface concur in rendering Wales much more adapted for pasture than agriculture. The soil, too, seldom possesses great natural fertility, except in some of the vales, of which those of the Clwyd in the north, and of Glamorgan in the south, are celebrated for productiveness. The latter, rather a plain than a vale, is of great extent, and grows excellent wheat. The system of agriculture, however, notwithstanding recent improvements, continues on the whole indifferent. The minerals, as already observed, are very valuable, and the south contains some of the largest coal and iron works in the kingdom, as well as the copper works of Swansea, probably the most extensive in the world. Of manufactures, properly so called, by far the most important are woollens. The principal articles are flannel, for which the principality has long been famous, cloth chiefly of a coarser description, and hosiery. The in-



habitants are almost purely Celtic in race, being the descendants of the early Britons, who were able to maintain themselves here when the rest of the country was overrun by the Germanic invaders. (See below.) Among the peculiarities which characterize the people, one of the most striking, at least to a stranger, is the female dress, consisting generally of a plain or checked gown, a mantle, a napkin of gay flaunting colours around the neck and shoulders, and a black beaver-hat, either cylindrical, like that worn elsewhere by men, or broad-brimmed and tapering to the form of a truncated cone. All classes are distinguished by civility and hospitality. Many curious superstitions, handed down by immemorial custom, still retain their hold. Most of the upper class belong to the Established Church (whose numbers are increasing), but the majority are Nonconformists, the most numerous bodies being the Congregationalists, the Calvinistic Methodists, and the Baptists.

*History.*—Previous to the Roman occupation Wales appears to have been chiefly inhabited by three British tribes, called the Silures, Dimetæ, and Ordovices. During the later period of the Roman occupation, perhaps from the reign of Diocletian, the subject part of the island was divided into four provinces, of which one, including the country from the Dee to the Severn, was called *Britannia Secunda*. It was after the invasion of the Saxons that the country acquired a distinctive national character as the refuge of the vanquished Britons who were gradually driven to the west. From this period till the final conquest of the country by Edward I. there is little but a succession of petty wars between the rival chiefs or kings into which both countries during a great part of the Saxon period were divided, or the more systematic efforts of the larger monarchy to absorb the smaller. Among the greatest of the Welsh heroes of the early period was Cadwallon. After being defeated by Edwin of Deira, or Northumbria, and compelled to flee to Ireland, he returned and defeated the Saxons in numerous battles, but was at last defeated and slain by Oswald of Northumbria in 635. While the border territories continued to be contested in incessant warfare between the two races Offa of Mercia built the celebrated dike known by his name to guard the marches which he had conquered. In the middle of the ninth century Roderick, or Rhodi Mawr, succeeded in uniting the whole of Wales into one principality, but he divided it among his sons into three principalities, called respectively Gwynedd (or North Wales), Ceredigion and Dyfed (or South Wales), and Powys (composed of parts of the counties of Montgomery, Salop, and Radnor). Soon after this the Danes began to invade Wales. The country was again re-united in the tenth century under Howel, surnamed Da, the good; but as the English monarchy also acquired unity it gradually prevailed over the smaller principality, and Athelstane received tribute as the sovereign of Wales, although his sway in the country was only nominal. The claim of the conqueror being resisted, William invaded the country and compelled the Welsh princes to do homage, but they continued in virtual independence, and became troublesome to the succeeding Norman monarchs by allying themselves with their disaffected subjects. William and his successors tried to break their spirit by granting fiefs in Wales to Normans and English on condition of conquest, and Henry I. introduced into the country a colony of Flemings. Henry I., Henry II., John, and Henry III., all made with various success a series of efforts to reduce the Welsh princes to submission. Llewellyn and David, princes of North Wales, successively did homage for that dominion to Henry III. On the death of David,

Llewellyn revolted against Edward I., but was defeated by Henry, and in a subsequent revolt was again defeated and slain by the Earl of Mortimer, 1284. His brother David, who followed his example, was taken and executed. Edward I. created his eldest son Prince of Wales, and from this time Wales was united with England.

*Language and Literature.*—The native name of the Welsh language is *Cymraeg*, the speech of the *Cymri*. The names *Wales* and *Welsh* are of foreign origin. They were given to the country and people of Wales by the Anglo-Saxons, and are the same as the names applied by other German tribes to foreigners of different nations; thus Italy was called *Welschland*, and the same form is preserved in *Walloon* and *Walachia*. It is also the name given by the Romans to the Gauls (*Gallia*=*Wallia*), with whom it possibly originated.

After some controversy the Celtic languages have been divided into two branches—the one consisting of Irish, Gaelic, and Manx, the other consisting of Welsh, Cornish, and Breton or Armorican. The degree of affinity between these two branches is represented as somewhat similar to that between Icelandic and German. A sufficient popular notion of it may be given by two facts. Professor Forbes has maintained that an intimate knowledge of Gaelic would not enable a person to master a single verse of the Bible in Welsh. On the other hand, the Rev. R. Garnett found on examination of 270 monosyllabic words occurring in Neilson's Irish Grammar that 140 were identical in sense and origin with corresponding Welsh terms, and thirty clearly cognate. What is still more remarkable, the Rev. Thomas Price, a Welsh scholar, who visited Brittany for the purpose of comparison of dialects, declared it distinctly impossible for a Welshman to communicate with the natives except through the medium of French. It is also a fact that the remains of ancient Welsh literature cannot be understood by persons merely acquainted with modern Welsh. The Celtic languages, though not destitute of literature, are exclusively spoken by peoples without an independent national existence, and consequently without the means of giving an authoritative and commanding position to their literature; hence they are more liable to degenerate into dialects than languages dominated by a national literature. This tendency is markedly shown both in Irish and Gaelic.

The Celtic languages are included in the Indo-European group, but they have, particularly the Welsh, some peculiarities that certain philologists have considered probably to belong to a language spoken in Britain by an earlier race of inhabitants than the Celts. But such peculiarities are few, and the Celtic tongues are clearly Indo-European. From internal structure Welsh is regarded as less ancient than Irish, but it is more ancient than the majority of modern European languages. The Cornish, now extinct, is by some scholars regarded as the elder dialect, and as being the language which was once spoken by the Britons. It resembles the Breton or Armorican more than Welsh. The Welsh cherish their language with great affection. They have transplanted it to America, where it prevails in some districts, and is represented by newspapers. In 1891 there were in Wales 508,000 people who knew no English, or at least habitually spoke Welsh. Numerous predictions of its extinction have been falsified, and scholars seem now disposed to take an opposite tone; but the necessity of learning English is so obvious, and the inconvenience of retaining two languages so manifest, that in spite of conservative zeal and hot-house nursing it would appear to be merely a question of time when it shall cease to be spoken.



Welsh is not regarded by strangers as a euphonic language. Its vocabulary is rich in constructive power. It does not, like English, freely import ready-made foreign terms, but forms new derivatives from its own roots, and assimilates what it borrows to its own forms of composition. It thus remains a closely-compacted and homogeneous language. The Welsh alphabet contains thirteen simple and seven double consonants, and seven vowels, with numerous diphthongs and triphthongs. *C* has the sound of *k*; *ch* is guttural; *dd*=soft *th*, as in *this*; *f*=*v*; *ff*=*f*; *ll* is a sound peculiar to Welsh, a sort of aspirated *l*; *u* and *y* have also peculiar sounds, the former resembling *i* in *th*, the latter *i* in *first*; *w*=*oo*. The accent is always on the ultimate or penultimate syllable. The most striking euphonic peculiarity of Welsh is mutation or permutation. There are certain established relationships of sequence in sounds or letters, in virtue of which the initial letters of words give way to the final letters of the preceding words, and are replaced by the letters to which the latter are supposed to have a special affinity. Thus *fy* (my) prefers to be followed by *nh*; hence *tad*, father, preceded by *fy*, becomes *fy nhad*. In like manner are formed *ei ddd*, his father; *ei thad*, her father. The rules of permutation are numerous and complicated, and it presents one of the greatest difficulties to learners of Welsh. As it depends on sound or alliteration it has in general no ineffective value, and though probably originating in euphonic considerations it does not retain a euphonic value. The Welsh, however, doubtless from habit and association, attach much importance to it. Among works on the Welsh language the following may be mentioned: Rhys's *Lectures on Welsh Philology* (1877); Rowland's *Grammar*; dictionaries by Pughe and D. Silvan Evans (not yet complete); and Southall's *Wales and her Language* (1892).

The library of the University of Cambridge contains in a paraphrase of the Gospels a few fragments of Welsh writing dating probably from the ninth century, but practically the oldest Welsh manuscripts are the Black Book of Carmarthen, belonging to the twelfth century, the Book of Aneurin, dating from the end of the thirteenth century, the Book of Taliesin, of the early fourteenth century, and the Red Book of Hergest, of the fourteenth or fifteenth century. The first and third of these are included in the Hengwrt collection, originally made by Robert Vaughan (1592-1667) and his contemporary John Jones, and now in the library at Peniarth, in Merionethshire. The Red Book is in the library of Jesus College, Oxford. These manuscripts were all edited by W. F. Skene in his *The Four Ancient Books of Wales* (1868), and they also form a chief part of the Old Welsh Texts which Prof. Rhys and J. G. Evans have edited. They all contain much material belonging to a period several centuries before their own dates, but critics and students are not yet agreed as to the date and authorship of their contents. Of the four bards, known as *Cynfeirdd*, whose work is alleged to be represented in these books, two, namely Taliesin and Myrddin (or Merlin), are regarded by Professor Rhys as purely mythical, but others consider that there was a historical Taliesin and a historical Myrddin of the sixth century who were afterwards identified with earlier mythical personages of the same names. The other two bards usually assigned to the same period are Aneurin and Llywarch Hen. The Y Gododin of the former, found in the book named after him, a poem dealing with the Saxon victory over the Strathclyde Britons at Catterthun in 567, is generally accepted as genuine. The most recent edition is that of Thomas Stephens (1888). To Llywarch Hen are ascribed many poems

in the Red and Black Books, which were edited in 1792 by Dr. William Owen Pughe under the title, *The Heroic Elegies and other Pieces of Llywarch Hen*. A work of immense value to students of Welsh literature was the *Myvyrian Archaeology*, published in three volumes from 1801 to 1807. It was prepared by Owen Jones (Owain Myvyr, 1741-1814), Edward Williams (Iolo Morgannwg, 1746-1826), and William Owen, afterwards W. O. Pughe (1759-1835), and in it was published a great mass of Welsh poetry down to the fourteenth century, together with a large part of the early prose literature of the language. The laws ascribed to Howel Dda, a tenth-century prince, were edited by Aneurin Owen in 1841 under the title *The Ancient Laws and Institutes of Wales*.

The period from the sixth to the eleventh century is almost barren from the point of view of literature, though the names of Meigant, Cuhelyn, and Elaeth are attached to poems of this period in the Black Book. The eleventh century witnessed a great literary revival, due largely to the influence of the kings Gruffydd ab Cynan and Rhys ab Tewdwr. Meilyr Brydydd, who died about 1140, is the first of the mediæval bards to whom a fairly definite date can be given. He is represented in the *Myvyrian Archaeology* by an elegy on his master Gruffydd ab Cynan and two other poems. His son Gwalchmai wrote odes in honour of the prince Owain Gwynedd, one of which has been adapted by Gray. Eimion and Meilyr, sons of Gwalchmai, were also eminent bards. Other poets of the twelfth century were Owain Cyveiliog, prince of Powys; Cynddelw, who wrote poems in honour of the preceding; Howel ab Owain Gwynedd, a son of the North Welsh prince Owain Gwynedd, author of stirring martial odes; Llywarch ab Llywelyn, also called Prydydd y Moch, who has been called the most illustrious Welsh bard of the Middle Ages, represented chiefly by poems addressed to North Welsh princes; and Gwynvardd Brycheiniog. The chief bards of the thirteenth century were Davydd Benfras, Elidyr Sais, and Eimion ab Gwgawn, who sang the praises of the great prince Llywelyn ab Iorwerth; Llygad Gwr, Bleddyn Vardd, and especially Gruffydd ab yr Ynad Coch, who wrote of the prince Llywelynab Gruffydd; Prydydd Bychan, whose poems relate to princes of south Wales; Philip Brydydd; and Howel Voel. Welsh poetry reached its high-water mark in the fourteenth century, when the three Eisteddfods of the Renaissance, as they are called, led to a more exact determination of the rules of metrical form on the basis of the sound-correspondences known as *cynghanedd*. Rhys Goch ab Rhicert, a Glamorgan poet, is represented by many beautiful love poems, and his contemporary and rival, Davydd ab Gwilym, is one of the very greatest of all Welsh bards. The poems of the latter deal mainly with love themes, and show a marvellously keen and sympathetic insight into nature. They were edited by Owen Jones and Pughe in 1789, and were admirably translated into English by A. J. Jones in 1834. Madog Benfras wrote an elegy on Davydd ab Gwilym. Iolo Goch, whose real name was Edward Llwyd, is chiefly known for the stirring martial odes with which he inspired the followers of Owen Glyndwr (or Glendower). An incomplete edition of them by Robert Jones appeared in 1877. Other poets of this period were: Sion Cent or John Kent, who is sometimes said to have been a Lollard, and who also wrote in prose on grammar, theology, and other subjects; Gruffydd ab Maredudd ab Davydd, author of a very beautiful elegy; Rhys Goch Eryri; Dafydd Nanmor; Trahaearn; Iorwerth Vychan; Casnodryn; and Gronwy ab Davydd. The odes of Lewis Glyn Cothi (fl. 1450-86) are of con-

siderable historical value. They were edited in 1867 by W. Davies and John Jones. About the same time Ieuan Brydydd Hir wrote his poem on Old Age, and Maredudd ab Rhys his Ode on Fishing; and a little later came Tudur Aled (1480-1525), a poet of great distinction. Guttun Owain was both a poet and a historian.

The early prose literature of Wales consists largely of chronicles or Bruts, of tales or romances, which are of widely different date; and of Triads, or brief statements of various kinds arranged in triplets, which date from the twelfth century onwards. The most important of the Bruts is the Brut y Tywysogion, or Chronicle of Princes (Rolls Series, 1860); and the most important of the romances are those from the Red Book, edited and translated by Lady Charlotte Guest in *The Mabinogion* (1849). Lady Guest's book furnished Tennyson with the materials of his *Geraint and Enid*. The most noteworthy writers in prose and poetry from the sixteenth to the eighteenth century are the following: William Lleyn or Owen (d. 1587), a poet; Lewis Morgannwg (early sixteenth), poet and historian; Edmund Prys (d. 1624), whose version of the Psalter (1621) is still in use; Griffith Roberts, who published a Welsh grammar at Milan in 1567; William Salesbury, whose translation of the New Testament appeared in 1567; Dr. William Morgan, bishop of St. Asaph, who translated the whole Bible into Welsh (1588); Morgan Llwyd (1619-59), a Puritan divine and mystic, chiefly known by his *Llyfr y Tri Aderyn* (Book of the Three Birds, 1653); Charles Edwards (d. about 1691), author of a history of Christianity (1671); Huw Morris (1622-1709), a Royalist who afterwards accepted the Revolution settlement, the greatest of Welsh ballad-writers; Bishop Parry, who was mainly responsible for the present Welsh version of the Bible (1620); Ellis Wynne (1671-1734), author of the famous *Gwledigaethau y Bardd Cwsg* (Visions of the Sleeping Bard, 1703; English translation by George Borrow, 1860, and R. G. Davies, 1897), which is regarded as the finest of Welsh prose works; Theophilus Evans (1694-1767), a clergyman who wrote a very popular but very untrustworthy work on Welsh history entitled *Drych y Prif Oesoedd* (1739); Lewis Morris (1700-65), a man of splendid attainments in widely different departments, a good poet and an able antiquarian; Rev. E. Evans (1731-89), a poet who is chiefly known by his *Specimens of the Ancient Welsh Bards* translated into English (1764); and Goronwy Owen (1723-1769?), one of the greatest of Welsh poets, a clergyman given to intemperance, who died in America. Of more recent writers who have maintained the traditions of Welsh literature the following may be mentioned: Dr. Lewis Edwards (1809-1887), author of *Essays, Literary and Theological* (1867) and *The Atonement* (1860; English translation, 1886); Samuel Roberts (1800-1885) and his two brothers, authors of numerous works of many kinds; Dr. William Rees (1802-1883), author of a long epic poem *Emmanuel* (1861-1867) and many other poems, besides a large amount of work in prose; Daniel Owen, novelist; Robert Williams (Robert ab Gwilym Ddu, 1767-1850), known by *Gardd Eifion* (1841), a volume containing many poems, chiefly religious; David Owen (Dewi Wyn, 1784-1841), chiefly remembered by his noble poem on *Charity* (1819); and the poets Eben Fardd, Ieuan Glan Geirionnyd, Emrys, Islwyn, and Ceiriog. See *Stephen's Literature of the Kymry* (1849; 2nd edn., 1876); *Matthew Arnold's Studies of Celtic Literature* (1867); *Watts's Sketch of Welsh Literature* (1863); recent works by O. M. Edwards; &c.

WALES, NEW SOUTH. See NEW SOUTH WALES.

WALES, PRINCE OF. See PRINCE OF WALES.

WALES, UNIVERSITY OF (in Welsh, *Prifysgol Cymru*), an institution established by charter in 1893, and formed by the union or association of three already existing colleges, the University College of Wales, Aberystwith, founded in 1872; the University College of North Wales, Bangor, founded in 1884; and the University College of South Wales and Monmouthshire, Cardiff, founded in 1883. Each of the colleges has a women's hall of residence, that of the last being known as Aberdare Hall. There are no special university buildings apart from those of the colleges, but there are temporary offices at Newport, Monmouth. The university has power to grant degrees in arts or literature, science, law, theology, and music; but the constituent colleges do not supply a full course of instruction in each of these subjects, the necessary courses for the degrees of B.A. and B.Sc. being at present those chiefly provided. As regards theology, instruction is furnished by a number of theological colleges in the principality, at which students may qualify for the degree of B.D. The classes are open to persons of both sexes above the age of sixteen years. The first matriculation examination of the university was held in 1895.

WALFISH (also WALVISCH) BAY, a harbour and small territory belonging to Britain, on the coast of German South-west Africa, close to the parallel of 23° s. The harbour is a good one, and is formed by a sandy spit of land which projects northwards parallel with the coast and ends in a point known as Pelican Point. It receives the river Khuseb at its head, and just beyond the northern frontier of the territory is the mouth of the river Swakop, where the German authorities have constructed a new harbour, known as Swakopmund. The enclave is included in Cape Colony for administrative purposes. The area is 430 sq. miles, and in 1891 the population numbered 768, of whom only 31 were white.

WALFORD, EDWARD, clergyman and miscellaneous author, born near Chelmsford on Feb. 3, 1823, was the son of an Anglican clergyman. He was educated at Hackney and the Charterhouse, and entered Balliol College, Oxford, in 1840. He gained distinction in classics and graduated B.A. in 1845. He was ordained deacon in 1846 and priest in 1847, but a few years later he joined the Roman Catholic Church. He returned to his mother church in 1860, again went over to the Roman communion in 1871, and in 1896 returned again to the Church of England. For a short time he was an assistant-master in Tonbridge school, but he spent the greater part of his life in general editorial and literary work. He started *Hardwicke's Shilling Baronetage* and *Knightage* and similar works, and in 1862 he edited *Men of the Time*. He edited the *Antiquary* in 1880-81, and from 1881 to 1886 he was editor of the *Antiquarian Magazine* and *Bibliographer*, of which he was the founder. He was author of *A Handbook of the Greek Drama* (1856); *Old and New London* (1872-78), with Walter Thornbury; *Louis Napoleon: A Biography* (1873); *Life of Beaconsfield* (1881); *Greater London* (1883-84); *The Jubilee Memoir of Queen Victoria* (1887); *William Pitt: A Biography* (1890); *Patient Griselda*, and other Poems (1894); and other works. He also edited *Butler's Analogy and Sermons*, translated *Aristotle's Politics and Economics* and several ecclesiastical histories for Bohn's libraries, and wrote the *Juvenal* in the *Ancient Classics* for English Readers. His death occurred at Ventnor on Nov. 20, 1897.

WALHALLA, or VALHALLA, the ancient paradise of the Scandinavian deities, for an account of

which see **NORTHERN MYTHOLOGY**. The name has been given to a fine building, on the model of a Greek temple, erected by Louis I. of Bavaria in 1830-42, on the bank of the Danube near Ratisbon, and intended, by means of statues, busts, &c., to commemorate all the great men of Germany.

**WALKER, FREDERICK**, painter, was born in London on May 26, 1840. After an ordinary school education he worked for a time in an architect's office, and then pursued his art studies at the British Museum, in an art academy, and in the Royal Academy schools. He became an apprentice to Whymper the wood engraver in 1858, and soon afterwards he began to provide drawings for *Good Words*, the *Cornhill Magazine*, and other periodicals. He illustrated the *Adventures of Philip* and the *Denis Duval of Thackeray*. He exhibited his first oil picture, *The Lost Path*, at the Academy in 1863. He was elected an associate of the Old Water-colour Society in 1864, and in 1871 he became an associate of the Royal Academy. He died at St. Fillans, in Perthshire, on June 4, 1875. His principal pictures in oils were: *Wayfarers* (1866), by some considered his best oil-painting; *Bathers* (1867); *Vagrants* (1868), in the National Gallery; *The Old Gate* (1869); *The Plough* (1870); *At the Bar* (1871); *The Harbour of Refuge* (1872), in the National Gallery; and *The Right of Way* (1875). Among his more numerous works in water-colour the following may be mentioned: *Philip in Church* (1863); *The Young Patient*; *The Shower*; *The Village School*; *Jane Eyre*; *Refreshment*; *Spring*; *Autumn* (1865); *The Bouquet* (1866); *The Gondola*; *In a Perthshire Garden*; *The Housewife*; *The Rainbow*; and *The Fishmonger's Shop*. See his *Life and Letters* (1896) by J. G. Marks.

**WALKER, GEORGE**, noted for his share in the defence of Londonderry, was born in 1618 either in Tyrone or at Stratford-on-Avon, and was educated at Glasgow University. He took orders, and in 1674 was presented to the living of Donaghmore, near Dungannon. In April, 1689, he became joint-governor of the besieged town of Londonderry after the traitorous governor Lundy had been allowed to escape, and he did much to inspire the heroic defenders. On his way to England after the relief, to present a loyal address to the king, he received many tokens of national gratitude and esteem. He received the thanks of the House of Commons, and had honorary degrees conferred upon him by Cambridge and Oxford. He fell at the battle of the Boyne on July 1, 1690, being at the time of his death bishop-designate of Derry. His *True Account of the Siege of Londonderry* (1689) and *Vindication of it* are reprinted in *Dwyer's Siege of Londonderry* (1893).

**WALKER, JOHN**, actor and lexicographer, was born at Colney Hatch, Middlesex, on March 18, 1732. After losing both his parents he became an actor, and for a time he was engaged by Garrick at Drury Lane. He was a leading member of the company at Crow Street Theatre, Dublin, in 1758-62, and during the five following years he was at Covent Garden. In 1768 he left the stage, and after conducting a school at Kensington for a few years he became a lecturer on elocution. He died in London on Aug. 1, 1807, having for several years been a Roman Catholic. His lexicographical and elocutionary works include: *A Dictionary of the English Language*, answering at once to the *Purposes of Rhyming, Spelling, and Pronouncing* (1775; latest edn., 1888); *Elements of Elocution* (1781); *A Rhetorical Grammar* (1785); *The Melody of Speaking Delineated* (1789); *A Critical Pronouncing Dictionary and Expositor of the English Language* (1791), his chief work, which was long regarded as

a standard for pronunciation and which has gone through many editions; *The Academic Speaker* (fourth edn., 1801); and *The Teacher's Assistant in English Composition* (1801-02).

**WALKER, WILLIAM SIDNEY**, a Shaksperian scholar, son of a naval officer, was born at Pembroke on December 4, 1795. He was educated at Doncaster and Eton, and in 1815 entered Trinity College, Cambridge, where he highly distinguished himself in classics and graduated in 1819, becoming a fellow of his college in the following year. He applied unsuccessfully in 1824 for the chair of Greek in the university. Unorthodox views regarding eternal punishment prevented him from taking orders, and accordingly he had to resign his fellowship in 1829. He was now without means of support; but the generosity of his friend W. M. Praed and of Trinity College enabled him to live modestly in London, where he removed in 1831. After years of mental decline he died on Oct. 15, 1846. His friend Moultrie edited in 1852 a collection of his *Poetical Remains*; and another friend, William N. Lettson, compiled from his papers the works entitled *Shakespeare's Versification*, and its *Apparent Irregularities explained by Examples from Early and Late English Writers* (1854); and *A Critical Examination of the Text of Shakespeare, with Remarks on his Language and that of his Contemporaries, together with Notes on his Plays and Poems* (1860). These volumes, though very unmethodical, are of the utmost value to students of Shakespeare and Elizabethan literature generally.

**WALKING**. See **LOCOMOTION (ANIMAL)**.

**WALKING-LEAVES** and **WALKING-STICKS**. See **LEAF-INSECTS**.

**WALLACE, ALFRED RUSSEL**, a distinguished naturalist and writer on land nationalization, spiritualism, and vaccination, of Scottish ancestry, was born at Usk, in Monmouthshire, on Jan. 3, 1823. He was educated at Hertford Grammar School, and was afterwards articled to a land surveyor and architect. When resident at Leicester as English master at the collegiate school he made the acquaintance of Henry Walter Bates, who, like himself, was an enthusiastic entomologist longing for a wider field of work. The publication in 1847 of Edwards's *Voyage up the River Amazon* gave definite form to their vague speculations, and in April, 1848, the two friends set sail from Liverpool on a journey to the Amazon valley which marks an epoch in scientific travel. With Bates he ascended the Tocantins in August 1848, and in the following year they ascended the Amazon. In March, 1850, they separated, Wallace taking the basin of the Rio Negro for his ground and Bates that of the Solimoes or Upper Amazon. Wallace returned to England in 1852, and in the following year issued an excellent account of his wanderings under the title *A Narrative of Travels on the Amazon and Rio Negro, &c.* Another result of this journey was a small work on *Palm-Trees of the Amazon and their Uses* (1853). Of still greater importance to the progress of modern biological geography and philosophy was his eight years' residence (1854-62) in the islands of the Malay Archipelago, because it led him to the formulation of his theory of natural selection, and produced that scientific classic, *The Malay Archipelago, the Land of the Orang-Utan and the Bird of Paradise: a Narrative of Travel, with Studies of Man and Nature* (2 vols., 1869). His natural selection theory was contained in a paper which he sent to Mr. Darwin in 1858, and on July 1 of that year it was read at a meeting of the Linnean Society along with a statement of the practically identical theory which Darwin had been elaborating independently

for many years. Wallace's paper induced Darwin also to limit the scope of the work upon which he was engaged, and so precipitated the publication of *The Origin of Species* in 1859. His work in *Malaysia* is fittingly commemorated by the application of his name to the imaginary line (Wallace's Line) between Bali and Lombok which, as he showed, marked the boundary between an Asiatic and an Australian fauna in the archipelago. In 1870 he published a volume of *Contributions to the Theory of Natural Selection*, and in 1876 he issued the first thoroughly scientific treatise on zoogeography, a subject which he has made peculiarly his own, under the title *The Geographical Distribution of Animals, with a Study of the Relations of Living and Extinct Faunas as elucidating the Past Changes of the Earth's Surface* (2 vols.). This subject was further developed in the more popular work, *Island Life, or the Phenomena and Causes of Insular Faunas and Floras*, including a Revision and attempted Solution of the Problem of Geological Climates (1880). *Tropical Nature and other Essays* (1878) contains suggestive papers on sexual selection, colour in nature, and similar subjects, and was reissued, with modifications and additions, in one volume along with *Contributions to the Theory of Natural Selection* in 1891. In *Darwinism: an Exposition of the Theory of Natural Selection, with some of its Applications* (1889), he gives a final and masterly statement of the theory of organic evolution as he conceives it, with abundant illustrations from his first-hand knowledge of the facts. He stands by pure Darwinism, refusing to admit the additional elements, such as sexual selection, which Darwin himself adopted in his later works. He refuses to extend evolution to the development of mind, and he adopts Weismann's views on heredity. In short, he holds by organic evolution only in so far as it is consistent with or required by a spiritual interpretation of man and nature.

Dr. Wallace's work has been by no means confined to natural history. In 1866 he issued a work on *The Scientific Aspects of the Supernatural*; and in 1875 he gave in *Miracles and Modern Spiritualism* a full statement of his spiritualistic faith. He is also a pronounced anti-vaccinist. He issued in 1885 a pamphlet entitled *Forty-Five Years of Registration Statistics, proving Vaccination to be both Useless and Dangerous*. He gave evidence before the recent Royal Commission on the subject, and in 1898 he published *Vaccination a Delusion, its Penal Enforcement a Crime*, in which he endeavours to prove that the majority report of the commission is opposed to the best evidence laid before it. In *Land Nationalization: its Necessity and its Aims* (1882) he compares the landlord-and-tenant system of land tenure with an occupying tenancy under the state, and strongly advocates the latter. A *Land Nationalization Society*, of which he is president, has been formed to disseminate the principles of his book. *Bad Times: an Essay on the Present Depression of Trade* (1885) is another contribution to economics. He prepared the volume on *Australasia* (1879) in Stanford's *Compendium of Geography and Travel*, and to the new issue he contributed the first of the two volumes on *Australasia*, dealing with Australia and New Zealand (1893). In 1898 he published *The Wonderful Century, its Successes and its Failures, a review of the nineteenth century*; and in 1901, *Studies, Scientific and Social* (2 vols.). He was awarded the Royal Medal of the Royal Society in 1868, the Gold Medal of the Société de Géographie in 1870, the Darwin Medal of the Royal Society in 1890, the Founder's Medal of the Royal Geographical Society, and the Gold Medal of the Linnæan Society in 1892; and since 1881 he has been

in receipt of a Civil List pension of £200 per annum. He has received honorary degrees from Dublin, Oxford, and the University of Wales.

WALLACE, SIR RICHARD, art connoisseur, reputed half-brother (or son) of the fourth Marquis of Hertford, was born in London in 1818. He was brought up chiefly in Paris, and was early distinguished as an art collector. On the death of the fourth Marquis of Hertford, in 1870, he inherited valuable estates in Ireland, a Parisian house, Hertford House in London, and the splendid collection of pictures and art objects which had been brought together by the third and fourth marquises. He equipped ambulances for use in the Franco-German war, and spent a large sum for the relief of the besieged inhabitants of Paris. In 1871 he was created a baronet, and during 1873-85 he represented Lisburn in the House of Commons. He was created K.C.B. in 1878, partly in recognition of his services as a commissioner at the Paris exhibition. He died in Paris on July 20, 1890. His wife, daughter of a French officer, was married to him in 1871, and died on Feb. 16, 1897. He bequeathed his art collection to her, and she bequeathed it to the nation. On the recommendation of a commission Hertford House was purchased for £80,000 as a home for the collection, and in 1900 it was opened to the public. It includes pictures, sculptures, and other art treasures, as well as arms and armour, furniture, &c., and has been valued at some £2,000,000.

WALLACE, SIR WILLIAM, the hero of Scottish independence, is said to have been the younger son of Sir Malcolm Wallace of Elderslie, by Jean, daughter of Sir Reginald Crawford, sheriff of Ayr. He was probably born about 1270, and was his father's second son. He was educated at Dunipace, in Stirlingshire, and afterwards at Dundee. Owing to the want of contemporary Scottish records, the real facts regarding his life and achievements remain in much obscurity. Many incidents rest solely on the authority of Blind Harry, who wrote about two hundred years later, and can hardly be regarded as a serious historian. The body of tradition, however, in respect to such a character is not to be despised, and Burton, who himself relies mostly on English authorities, has observed that the fundamental facts of some of Blind Harry's narratives have from time to time been confirmed by slight but significant incidental circumstances which have come to light. We can only give here a bare outline of such facts as are generally recognized. Wallace is represented as a man of herculean proportions and great personal strength, and it is certain that he possessed in a high degree the personal influence and power of command which distinguish a great party leader from a mere tactician. The known incidents of his career show that he possessed also an inventive genius in military tactics. He attached to himself and made great leaders who secured the final success of his cause. He had thus every qualification of a consummate commander. Wallace is represented as having been for some years engaged in a partisan war against the English before what is represented by Blind Harry as the turning-point in his career took place, the burning of the town of Lanark and the murder of Hazelrig the sheriff. According to tradition Hazelrig was killed because he had put to death Wallace's betrothed for refusing to marry his son. The fact of the attack on Hazelrig was charged against him in London, and has also been confirmed by contemporary English testimony. This incident is ascribed to May, 1297. Soon after, he attacked Ormesby, the justiciary, while holding a court of justice at Scone, and Beck, bishop of Durham, at Glasgow, whom he put to flight. Among the followers of Wal-

lace about this time was William of Douglas, the representative of a great Border family, which subsequently contributed invaluable aid to the war of independence. Surrey, who had been commissioned by King Edward to put an end to the disturbances in the north, sent his son Percy in advance with 800 knights, and, it is said, 40,000 footmen. Percy received at Irvine the submission of Bruce, earl of Carrick, James, steward of Scotland, Alexander de Lyndesey, and William of Douglas, who had been in arms for the national cause. Wallace retired to the north, and recruited in Aberdeenshire and other lowland counties. He took most of the northern fortresses, and was besieging the Castle of Dundee, when he heard that Surrey and Cressingham were advancing upon Stirling. He resolved to meet them, and took up a position encompassed by a loop of the Forth in front of the Abbey Craig, a hill near the Abbey of Cambuskenneth. Surrey determined to attack him, and the English crossed the Forth on a narrow bridge from early morn till near noon, while the Scots were drawn up as spectators of their passage on the hill. When Wallace deemed the enemy sufficiently divided he attacked those who had crossed with his whole force, sending at the same time a detachment to secure and hold the head of the bridge. The victory was complete. Cressingham was killed, and Surrey fled to Berwick. After this Wallace appears with the title of Guardian of the Kingdom, which was temporarily cleared of the English, and is found conducting an invasion, or series of organized raids into England. In 1298 Edward entered Scotland with an army estimated at 7000 men-at-arms and 80,000 footmen. Wallace retired before him, wasting the country, but was at length overtaken at Falkirk in a position where he was compelled to fight. He drew up his army on an inclined plain with his horsemen, about 1000, in the rear. The footmen were arranged in circles, the bowmen in the centre, and the spearmen in the front rank kneeling. In this order they resisted for a time the attacks of the Englishmen-at-arms, but the circles were gradually broken, and the army routed. After this Wallace disappears from the scene. Whether he resigned his guardianship, or was compelled by the jealousy of the nobles, as is commonly reported, to surrender, it is not known. It is certain that he went to France, probably in 1299, and he may even have visited Rome in the national cause. The council of regency which succeeded him carried on the war for some time with spirit; but on 9th February, 1304, they and their followers were admitted to King Edward's peace. Wallace was excepted by name. He was then in the country, and every exertion was made to secure his apprehension. It was effected through Sir John de Menteith, governor of Dumbarton Castle. He was conveyed to London, through which he was carried on 22d August, 1305. He was put on trial at Westminster before a special commission, crowned in mockery, according to the chronicles, with a wreath of laurel, as a subject of the King of England; but as an outlaw he was not permitted to plead to the indictment. He was convicted of treason and rebellion, though he had never acknowledged Edward as his king, and was executed on 23rd August. He was dragged to a gallows in Smithfield, where he was hanged. His heart, liver, lungs, and entrails were burned, and his body was beheaded and quartered. The head was placed on a pole on London Bridge, and his quarters were exposed at Newcastle, Berwick, Perth, and Aberdeen or Stirling. Besides the histories of Scotland and others relating to the period, see the biographies by Moir (1886) and Murison (1898).

WALLACE, WILLIAM VINCENT, musical com-

poser, was born at Waterford in 1814. His father, a Scotchman, was bandmaster of the 29th Foot and a bassoon-player in a Dublin theatre orchestra. Young Wallace soon gave evidence of great musical ability, became a skilful player on several instruments, and in 1829 was organist in Thurles Cathedral. His enthusiasm was stimulated by hearing Paganini play in 1831, and in 1834 he played a violin concerto composed by himself. He went to Australia in 1835 and worked at sheep-farming. But he soon returned to music, and travelled to New Zealand, where he had a romantic escape from assassination by the Maoris. His travels afterwards extended to the South Sea Islands, Oudh, Nepal, Kashmir, Valparaiso, Buenos Ayres, Santiago, Lima, and Mexico, and proved very profitable from a financial point of view. He returned to London in 1845, and towards the end of that year his popular opera of *Maritana* was produced at Drury Lane with great success. *Matilda of Hungary* (1847) was damaged by an exceedingly bad libretto. He next visited Germany and France, and received a commission to compose a work for the Grand Opéra at Paris, but the failure of his sight prevented him from carrying it out. After a voyage to America he again settled in England in 1853, and in 1860 *Lurline*, a better work than *Maritana*, was produced with even greater success at Covent Garden. Other operas were the *Amber Witch* (1861), *Love's Triumph* (1862), *The Desert Flower* (1863), and *Estrella*, the last left unfinished at his death. He died in France on Oct. 12, 1865.

WALLACHIA. See ROUMANIA.

WALLENSTEIN, or WALDSTEIN, ALBRECHT WENZEL EUSEBIUS, VON, Duke of Friedland, Mecklenburg, and Sagan, a famous leader in the Thirty Years' war, was born on the paternal estate of Hermanic in Bohemia, 15th September, 1583. Both his father and mother belonged to the Bohemian evangelical church. In his youth he was sent to the school of the brethren at Koschumberg; but on the early death of his parents, his uncle Albrecht Slavata placed him under the Jesuits at Olmütz, and after he had been brought over to the Catholic faith he finished his studies at the Universities of Bologna and Padua, and travelled in Italy, Germany, France, Spain, England, and the Netherlands. He took military service in Hungary under General Basta, and returned to Bohemia at the peace of 1606 with the rank of captain. Here he married an elderly widow, who on her death in 1614 left him considerable landed property. From his uncle he inherited numerous estates. In 1616, on assisting the Archduke Ferdinand with 200 dragoons in his war against Venice, he was raised to the rank of count and made a colonel. By his second marriage, with Isabella Katharina, daughter of Count Harrach, he acquired great influence at court. At the outbreak of the Bohemian war he refused to join his compatriots and saved the military chest of Moravia for the emperor, raised a regiment of cuirassiers and fought against Thurn and Bethlen Gabor, with the post of quartermaster general of the imperial army. When the estates of the vanquished Bohemians were confiscated in 1620, he bought sixty lordships and estates from the emperor for the sum of 7,290,228 florins, for a part of which his services were reckoned, and in 1624 he was raised to the dukedom of Friedland. He now applied himself to the care of his estates, which were valued at 30,000,000 florins, and of which he knew how to make the most by economy and strict exaction of his revenues. When the emperor was involved in new troubles by the Lower Saxon league in 1625 he offered to raise 20,000 men for his service by his own efforts. Before he had completed his levy he was named

generalissimo and field-marshal, and set out at the head of 30,000 men to co-operate with Tilly. In April, 1626, he gained a victory over Count Mansfeld at Dessau, and when that general proceeded at the close of the year to join Bethlen Gabor, he followed with 50,000 men and brought the latter to conclude a truce. In the campaign of 1627 he conquered Silesia and bought from the emperor the dukedom of Sagan, at a price in which his military expenses were reckoned. The estates of Mecklenburg having been forfeited in the war, he was invested in them, first as security for his expenses, and afterwards as a regular fief in 1629. In September, 1630, owing to the jealousy of the nobles and the license of his followers, he was deprived of his command. When Gustavus Adolphus invaded Germany, Wallenstein attempted to negotiate with him on his own account, but the distrust of the Swedish hero frustrating his intentions, he listened to the earnest entreaties of the emperor, and again took the field, having procured a formal capitulation securing to himself almost absolute power, together with great personal advantages. After some partial successes he encountered the King of Sweden at Lützen, 16th November, 1632, in which battle Wallenstein was defeated and Gustavus killed. During winter he recruited his army in Bohemia, but in the following campaign he showed remarkable inactivity. After the death of the Swedish king he had reopened negotiations with the enemies of the emperor, by whose assistance he hoped to place himself at the head of affairs in Germany. The matter proceeded slowly as his offers were received with much mistrust, especially by the German princes; he resumed hostilities to make his value felt, then reopened negotiations. His proceedings were known at the court of Vienna; but he was at the head of an army largely consisting of foreigners, and many of whose leaders were personally pledged to him alone. The emperor was not strong enough to remove him, and was base enough to have recourse to assassination. On 24th Jan. 1634, he signed a secret patent conferring the command of the army on Count Gallas, who was instructed to arrest Wallenstein and his associates, and throw them into prison. On Feb. 18 an open proclamation was made commanding the army to obey only Generals Gallas, Piccolomini, and others named. This was posted in Prague on 22d February, and forced matters to extremities. Wallenstein left Pilsen with some of his confidential associates on the 23d to take refuge in the fortress of Eger, which he reached on the 24th. Here he was assassinated on the evening of the 25th. The plenipotentiary of Saxony and Brandenburg had reached Zwickau, and the plenipotentiary of France Frankfurt, on their way to Wallenstein's headquarters, when they received word of his death. The emperor openly rewarded the assassins, among whom were two Scotchmen and two Irishmen, Gordon, Leslie, Butler, and Devereux. Wallenstein's overtures to the enemies of the empire have been represented by his partisans as *ruses de guerre*.

WALLER, EDMUND, a celebrated English poet, was born at Coleshill, Hertfordshire (now in Buckinghamshire), on 3d March, 1606. He was early left an orphan with a considerable estate. He was educated at Eton and King's College, Cambridge. He is said to have been returned as member of Parliament for Amersham in his sixteenth year. In 1625 he was returned for Chipping Wycombe, and he sat for other places in several parliaments, including the Long Parliament. His first poem celebrated the escape from shipwreck of Charles I. on his return from Spain in 1623. It was published some years after, and had all the finish of his later

verses. His first wife, Anna Banks, a city heiress, dying a few years after their marriage, he courted Lady Dorothea Sydney, daughter of the Earl of Leicester, whom he celebrated in his verses under the name of Sacharissa, and Lady Sophia Murray, whom he distinguished by the name of Amoret, both without success, and married Mary Bresse or Bracey, by whom he had a large family, at what exact time is not known. In Parliament he at first opposed the court party, but afterwards became known as a royalist, and retained his place in the Long Parliament, it is said at the desire of the king, and openly expressed his royalist sentiments after the civil war began, which was freely tolerated, probably because of his want of influence. He was sent as a commissioner from Parliament to the king after Edgehill. Soon after this took place the incident called Waller's plot. The nature of the plot is not clearly understood, though Waller made an abject confession of all he knew, including the names of his confederates, some of whom, his near relations, were put to death. He was imprisoned for a year and fined £10,000, but it is said he had to spend three times that sum in bribes. On his release he retired to France. During this exile the first collection of his poems was published in 1645. In 1653 he obtained permission from Cromwell to return to England. In 1654 he addressed a Panegyric to the Lord Protector. In 1656 he recommended him in another poem to assume the royal title. Shortly after a poem on the death of the lord-protector, he addressed one to the king on his majesty's happy return. The proceedings of Monk apparently had not been anticipated. He again sat in Parliament, with intervals of cessation, up till the reign of James II. Burnet says his popularity in Parliament was great, but he did not take pains to understand its business, but only studied to gain applause, being a vain and empty, though a witty man. He died at Beaconsfield, 21st October, 1687. Waller's poetry was celebrated for elegance and polish at a time when these graces had been comparatively little studied, but it is destitute of all great qualities.

WALL-FLOWER (*Cheiranthus cheiri*), a cruciferous plant, which grows in the clefts of rocks and old walls, in most parts of Europe. The stem is naked, hard, and almost woody at the base, dividing above into leafy branches. The flowers are large, of a fine golden-yellow in the wild-plant, and agreeably scented. In the cultivated plant the flowers are of various and brilliant colours, and attain a much larger size. Double and semi-double varieties are common in gardens. It is a beautiful and favourite ornamental plant.

WALLINGFORD, a municipal borough of England, in Berkshire, on the Thames. It has good churches, a spacious market-place, a town-hall, grammar-school, free library, &c. It is situated in an agricultural district. It sent two members to Parliament from the twenty-third year of Edward I., but by the Reform Act of 1832 was deprived of one of its members. In 1885 its parliamentary representation was merged in that of the county. Pop. of mun. bor. (1891), 2989; (1901), 2808.

WALLIS, the German name of the Valais. See VALAIS.

WALLIS, JOHN, a celebrated mathematician, born in 1616 at Ashford in Kent, where his father was minister, was educated for the church at Emmanuel College, Cambridge, and having regularly taken his degrees, entered into holy orders, and in 1641 became chaplain to a Yorkshire baronet. In 1648 he obtained a living in London, and the following year was one of the secretaries to the assembly of divines at Westminster. He was one of the first members



of the scientific association which gave birth to the Royal Society, and in 1649 was appointed by the parliamentary visitors Savilian professor of geometry at Oxford. In 1653 he published a grammar of the English tongue written in Latin for the use of foreigners. He was admitted to the degree of Doctor of Divinity in 1654, and on the death of Langbaine was chosen *custos archivorum* to the university. He was particularly skilful in the art of cryptography, or deciphering; and having by this means been enabled to render considerable service to the royal cause, he was on the Restoration of Charles II. very favourably received at court, and made one of the royal chaplains. In 1661 he was one of the divines appointed to review the Book of Common Prayer; and as he complied with the terms of the act of Uniformity, he continued a steady conformist to the Established Church till his death. When the Royal Society was founded in 1663 the name of Dr. Wallis was included in the list of the earliest members; and he added much to the reputation of that body by his valuable contributions to the Philosophical Transactions. After a long life devoted to science and to the duties of his clerical profession, he died at Oxford in 1703. Among his mathematical works the most important are *Arithmetica Infinitorum*; *Mathesis Universalis, sive Opus Arithmeticum*; *Mechanica, sive de Motu Tractatus geometricus*; *De Sectionibus Conicis Tractatus*; and his *Algebra*. He also published some of the writings of Archimedes, Ptolemy, Aristarchus, and Porphyry. His works, including various treatises on theology, were published at Oxford (1692-99, three vols. folio); and a volume of his sermons, printed from the original manuscripts, appeared in 1791.

**WALLOONS**, the name given to the inhabitants of the Southern Netherlands, who are chiefly of Celtic or Roman extraction, and speak the French language, in distinction to the northern inhabitants of German race and language. The name is probably analogous to that given by the Germans to other foreign races, as the Walachians, Gauls, Welsh, &c. See *BELGIUM—People*, and *WALEs*.

**WALLSEND**, a mun. bor. (incorporated 1901) of England, in Northumberland, on the Tyne, 4 miles E.N.E. of Newcastle, with modern churches and chapels and the ruins of an ancient church; a library and concert-hall, &c. Coal is worked, and there are shipbuilding yards, blast-furnaces, engineering, copper, and chemical works. The town owes its name to its position at the end of the great Roman wall. Pop. (1891), 11,257; (1901), 20,932.

**WALL-TREES**, trees trained against walls with the view of regulating their branches with regard to light and heat, their own branches being exposed to the influences of the sun while not depriving those of other trees of the same benefit, and at the same time obtaining heat by radiation from the wall. This method of training is adopted chiefly, if not exclusively, for fruit-trees. In training trees in this way the regulation of the branches as to light and heat is not the only thing that has to be attended to. It is also important to provide as far as possible for an equal flow of sap to all the branches. The principal modes of training are the fan, the horizontal, the vertical, the oblique, and the wavy or curved. Fan-training is so called from the principal branches being disposed somewhat like the ribs of a fan. This mode of training may be commenced when the tree has made its first three shoots. The middle shoot is trained perpendicularly, and the two outer ones at an angle of about 45°, this elevation favouring the growth and strength of the whole plant. At the winter pruning the middle shoot is cut over three suitable buds, the shoots proceeding from which are

trained in the same way as the first three, the two outermost shoots being lowered to make room for the two additional ones. At the next pruning all the three inner shoots are cut in the same way as the middle one was at the first pruning, and the process is continued till the wall is sufficiently covered. Fan-training, or some modification of it, is usually adopted for stone-fruits, such as the peach, apricot, cherry, and plum. When employed for these the branches must not be trained too low, that is, too nearly at right angles to the central stem, otherwise the sap will pass them, and they will become weak and die off prematurely. In training the peach and nectarine the upright shoot is dispensed with, and a modification of the fan-shape is effected by branches proceeding from two main branches diverging on opposite sides of the central stem. Horizontal training has been long employed chiefly for the pear. In this case the training is commenced as in the first method, but the outer branches are gradually brought down till they are horizontal, and the only shoots trained are those proceeding from the principal stem, two of which on opposite sides are trained at every pruning in the same way as the first two. When the trees are vigorous, and the soil and climate favourable, two pairs of horizontal branches may be trained in one year. Oblique training exactly resembles horizontal training, except that the branches, instead of being made to take a horizontal direction, are trained obliquely upwards. In upright training two shoots are first trained obliquely like the upper limbs of a Y. Gradually these are brought down to a horizontal position, and when they have grown to a sufficient length the shoots that push on the upper side are allowed to grow upwards, care being taken that they grow at an equal pace. Wavy or curvilinear training admits of many variations. The stem may be serpentine and the branches oblique, the stem may be straight and the branches wavy, or both stem and branches may be wavy. The object of all these modes is to prevent the sap from flowing, according to its natural tendency, in much greater abundance towards the upper part of the tree than it does into the lower branches. A mode of training called pendulous training has been recommended, and occasionally practised in the case of varieties of apple and pear which are more apt to grow to wood than to produce fruit. It is a form of oblique training in which the branches are directed obliquely downwards instead of obliquely upwards. In all modes of wall training the proper direction is given to the branches by passing them through loops of woollen cloth nailed to the wall. These loops are renewed every year lest they should cause disease. In wall-trees the fruit is sometimes partially forced by hot flues in the wall against which they are trained.

**WALNUT** (*Juglans*), the common name of a number of trees belonging to the natural order Juglandaceæ. They are trees with alternate, pinnate, stipuled leaves and unisexual flowers, the staminate flowers forming an amentum or catkin; perianth 2-3-6-parted, with a scaly bract; stamens three or more; fruit drupaceous; ovary 2-4-celled at the base, unilocular at the apex. The common walnut (*J. regia*) was introduced into Europe (probably from Persia) at a remote period, and is now common in the central parts of that continent, but flourishes most in Italy, Spain, and the south-western departments of France. It is a lofty and beautiful tree. The fruit in the wild state contains a small hard nut, of inferior quality; but in the cultivated varieties the nut is much larger, the shell becomes thin enough to be easily crushed by the fingers, and the kernel is agreeably tasted. These nuts are highly esteemed, and often served up at dessert, and form



an article of commerce. The oil expressed from them is in general use as an article of diet in those districts where the tree abounds, and serves a still more important purpose in the preparation of fine colours; it is preferred on account of the complete and rapid manner in which it dries, and the facility of obtaining it perfectly limpid, by diffusing it upon water in large shallow vases. In copper-plate printing it is employed to produce a fine impression, either in black or colours. By boiling the husks when beginning to decay, and the bark of the roots, a substantial dark-brown colour is obtained, which is used by dyers for woollens, and also by cabinet-makers to stain other species of wood in imitation of walnut. The fruit, in a green state, before the shell hardens, is much used for pickling. Before mahogany was imported so abundantly into Europe the wood was employed almost exclusively in cabinet-making, and is still in general use for that purpose. It is preferred for the stocks of muskets, as it is lighter in proportion to its strength and elasticity than any other wood. Seven or eight varieties are cultivated. The Black Walnut (*J. nigra*) is found in most parts of the United States of America, the extreme north and east excepted, and the low district of the Southern States, where its absence seems to be owing to the nature of the soil, which is either too sandy or too wet. It requires a deep and fertile soil, and in favourable situations the trunk often attains the diameter of 6 or 7 feet. It is one of the largest of American trees, and yields to none in the majesty of its appearance. The nuts are often served upon table. The shell is very hard, and the kernel is divided by firm woody partitions, but has a sweet and agreeable flavour, though inferior to the European. The wood is very strong and very tenacious, when thoroughly seasoned is not liable to warp and split, and remains sound a long time, even when exposed to the influence of heat and moisture: the grain is sufficiently fine to admit a fine polish, and it is, besides, secure from the attacks of worms. It is greatly employed in cabinet-making wherever it abounds. The Butternut (*J. cathartica*) is a much smaller tree than the preceding, rarely exceeding 50 feet in height, with a trunk 10 or 12 inches in diameter. The fruit is elongated, covered externally with a viscid, adhesive substance; and the nut is hard, rough externally, and deeply and irregularly furrowed. The nuts are sometimes brought to market. The wood is light, of a reddish hue, and possesses little strength, but lasts long, and is secure from worms. A dark-brown dye is also obtained from the bark, which is employed for woollens; but that afforded by the Black Walnut is preferred. By piercing the trunk early in the spring, sugar may be obtained, but of inferior quality to maple-sugar. The hickory (which see) belongs to the same order.

WALPOLE, HORACE, EARL OF ORFORD, the fourth son of Sir Robert Walpole, was born 5th October, 1717. It is to be mentioned, however, that doubt has been cast on his birth. Cunningham, in his edition of Walpole's Letters, attaches faith to the scandalous story published by Lady Louisa Stuart, that he was the son of Lord Hervey. He was educated at Eton, and King's College, Cambridge, on leaving which he travelled two years on the Continent. Returning in 1741 he took his seat in the House of Commons as member for Callington, and he sat for various constituencies up to 1768. He always took a lively but superficial interest in politics, inclining sentimentally to extreme opinions. His parliamentary career requires no particular record, but it may be mentioned that in March, 1742, he spoke in defence of his father's administration, and in 1757 he exerted himself earnestly in behalf of

Admiral Byng. In 1747 he purchased Strawberry Hill, where he erected a Gothic villa, laid out the grounds with minute ingenuity, and made it a principal business of his life to adorn and furnish it according to a fantastic but refined and educated taste, with objects of curiosity and antiquarian interest, rare prints, pictures, books, and manuscripts. His maintenance was provided for by some sinecure appointments. To his antiquarian taste he added authorship, first in verse and afterwards more extensively in prose, and in 1757 he established a private printing-press at Strawberry Hill, at which he printed not only his own works but those of others, his editions often selling at very high prices on account of the small number printed. In 1791 he succeeded his nephew in the peerage. He never took his seat in the House of Lords, and appears to have avoided using his title. He died 2d March, 1797. The works of Horace Walpole are numerous. His first publication was a description of Sir Robert Walpole's pictures, printed privately in 1747, under the title of *Aedes Walpolianæ*. In 1757 a popular satire appeared called *Letter from Xò Hò*, a Chinese philosopher at London, to his friend Lien-Chi, at Pekin. Fugitive pieces in verse and prose, and Catalogue of the Royal and Noble Authors of England, with lists of their works, appeared in 1758. *Anecdotes of Painting in England*, five vols. 4to, were published in 1762-71. The *Castle of Otranto*, 1764, a romance, regarded as the type of a class which subsequently became popular, is very variously estimated. Praised by Byron and Sir Walter Scott, it is pronounced by Hazlitt dry, meagre, and without effect. The *Mysterious Mother*, a tragedy, and *Historic Doubts on the Life and Reign of King Richard III.*, appeared in 1768. Walpole became keenly attached to the opinions expressed in the *Historic Doubts*, on which he could not bear criticism. Some other publications followed these, and Walpole projected a collected edition, which was not completed, of his works. The two works on which his reputation now chiefly rests are his *Letters*, of which the best edition is that edited by Peter Cunningham, in nine vols. 8vo (London, 1857), and his *Memoirs and Journal*, a series embracing the reigns of George II. and III., from 1751 to 1783.

Walpole is almost unanimously pronounced the best of English letter-writers, it being understood that his letters were carefully prepared for the public, and that their vivacity and ease, like Sheridan's jokes, were laboriously studied. The memoirs are more bitter and cynical, but both are valued as a store-house of the more evanescent traits of contemporary history, being full of passing topics and occurrences, anecdotes, characters, and portraits. Though a keen and able he was not, however, an accurate or impartial observer. The want of depth and earnestness in his own character, his party prejudices, his vanity and love of effect, tempered all he wrote, and greatly detract from the weight of his evidence. Few writers, however, are more uniformly entertaining. Walpole's manners were affected both personally and as a writer. He was as fastidiously aristocratic in his personal notions as he was sentimentally liberal in his political opinions, and in both he was probably conventional rather than sincere. He was keenly sensitive to criticism and eager for applause, but under his vanity and frivolity there existed an indestructible sub-stratum of good sense and sound judgment. Allowing for affectation of humility, it is scarcely possible to doubt that, in his later years especially, he was ashamed of his own literary pretensions, and put a painfully modest estimate on his works. In one respect he underrated them. Of their value as a chronicle of current

events he was hardly in a position to judge, but this alone has perhaps prevented posterity from confirming his own estimate, and placing him among the mob of gentlemen who write with ease. His personal character is commonly charged with selfishness, coldness, and cynicism, but Mary Berry, who knew him intimately, but who was perhaps blinded by the partiality of personal attachment, gives a very different account of it.

WALPOLE, SIR ROBERT, Earl of Orford, a great Whig statesman, was a younger son of Sir Robert Walpole, M.P. for Castle Rising, and was born Aug. 26, 1676. He was educated at a private school at Massingham, on the foundation at Eton, and at King's College, Cambridge. Although his studies were not remarkable, he became a good classical scholar. On the death of his elder brother in 1698 he resigned his scholarship and went to live with his father in the country. In 1700 he married Catherine Shorter, grand-daughter of a Lord-mayor of London. He succeeded to the paternal estate the same year on the death of his father, and entered Parliament as member for Castle Rising, and in 1702 was elected for King's Lynn. He became an active member of the Whig party, and soon distinguished himself by attention to business, and, though not an orator, by practical debating power. In 1708 he was appointed secretary-at-war, and intrusted with the management of the House of Commons. He was one of the managers of the impeachment of Sacheverell (1710), though privately opposed to that measure. Soon after this the Whigs were dismissed from office. On the meeting of Parliament in 1712 he was convicted of a high breach of trust and notorious corruption, for receiving £1000 in consideration of two contracts of forage for her majesty's troops quartered in North Britain, granted by him as secretary-at-war. He was expelled the House of Commons, and imprisoned in the Tower. By his party Walpole was regarded as a martyr. He refused to make any submission, pleading precedent in his favour, and wrote a pamphlet in his own defence. He remained in prison, or held his levee in the Tower, till the prorogation. He was returned again for King's Lynn, but the House of Commons decided that he could not sit again in that Parliament. After the dissolution in 1713 he resumed his place and influence in the House. In the first ministry of George I. (1714) he was appointed paymaster of the forces. He was also in 1715 appointed chairman of the committee to impeach the late ministers. In October he was made first lord of the treasury and chancellor of the exchequer. In April, 1717, a split having occurred in the ministry, Walpole resigned, and made himself formidable in opposition by his revelations of the corrupt practices which had prevailed among himself and his colleagues while he was in office. He opposed the quadruple alliance and the South Sea Scheme, in which, however, he did not disdain to speculate. In June, 1720, he again took office as paymaster of the forces, and was intrusted with the measures rendered necessary by the failure of the scheme. (See SOUTH SEA BUBBLE.) On the resignation of Sunderland he again became first lord of the treasury, 2d April, 1721, and for twenty-one years held the highest office in the state without interruption. During his long administration the Hanoverian Succession, to which he was zealously attached, became firmly established, a result to which his prudence and political sagacity largely contributed. He promoted by an enlightened policy the commercial prosperity of the nation, and relieved the weight of taxation by many improvements in the tariff. In 1724 he was made a Knight of the Bath, in 1726 a Knight of the Garter, and on 9th Feb-

ruary, 1742, two days before his resignation, he was created Earl of Orford. So long a period of office did not of course pass without opposition. On the accession of George II. he was dismissed and re-appointed, the favour of Queen Caroline being of lasting service to him during this reign. In 1733 the opposition to his excise scheme proved too strong for him, and during the later years of his ministry he encountered increasing difficulties. When, after successive defeats in Parliament, he resigned, he was consulted by the king as to his successors, and allowed to stipulate for his own immunity. An attack was soon, however, made upon him in Parliament, and a committee of secrecy appointed to inquire into his administration. The committee's report charged him with having used undue influence at elections, with granting fraudulent contracts, and with speculation and profusion in the use of the secret service money. The king exerted himself to frustrate the inquiry, and on the other hand the committee did not gain credit for impartiality. The prosecution against Walpole was dropped. He took little further part in public affairs, but was frequently consulted by the king. He died 18th March, 1745.

WALPURGA, WALBURGA, or WALPURGIS, a female saint, born in England, sister of St. Willibald, first bishop of Eichstätt, in Germany, and niece of St. Boniface, the apostle of the Germans. She went, like her uncle and brother, to Germany as a missionary, and became, about the middle of the eighth century, abbess of a convent at Heidenheim, in Franconia. She must have been a learned woman, as she was considered the author of a Latin description of the Travels of St. Willibald. After her death (776 or 778) she received the honours of a saint, was believed to work many miracles, and chapels in honour of her were built in many places. From the circumstance that in German almanacs the name *Walpurgis* has been accidentally placed, sometimes alone, sometimes together with the names of the apostles Philip and James, against the first of May, the night previous to the first day of May, so famous in German legends for the assembling of the witches, has been called *Walpurgis night*. The first of May is an important day for the German cultivator; many contracts are made at this time; the labours of the field assume new activity, &c. It is not strange that, on so important a day, the devil and the witches were supposed to be more active than usual, and to assemble in a particular place to organize the work of evil. This superstition, however, may have had its origin in the ancient German mythology. Hence straw was burned in many places on the Walpurgis night, with a view of dispersing the malignant beings—a custom still preserved in some places. The chief convocation of the witches was considered to take place on the Brocken. Many customs connected with the first of May in Germany originated in this superstition.

WALRUS, or MORSE (*Trichechus Rosmarus*), a genus of Carnivorous Mammalia, belonging to the section Pinnipedia or Pinnigrada, and allied to the Seals (whicsee). The walrus is distinguished by having the upper canine teeth largely developed, and growing from persistent pulps to form tusks, by the help of which the animal manages to lift itself up from the sea on to the ice-floes it inhabits. No outer ears are developed; and the muzzle is full and protuberant, and covered with thick bristles. The arrangement of the teeth agrees with that of the seals. Six incisors exist in the upper and four in the lower jaw of the young walrus, but these soon disappear, with the exception of the outer pair of upper incisors. The tusks may attain a length of 15 inches or more, and they

grow downwards and slightly inwards. There are three simple molars on each side of the upper jaw in the adult, and four on each side of the lower jaw. Some authorities regard the first lower molar as a canine tooth. The walrus is monogamous in habits, each male keeping company with a single female only. It attains a length of from 10 to 15 feet, and is a large unwieldy animal. It is very active in the water, and swims well by means of its paddle-shaped feet. The walrus is hunted for the sake of the ivory afforded by its tusks, whilst its skin affords a valuable, thick, and durable leather. The Esquimaux and others use its bones, skin, and flesh. The food of these animals consists of fishes, small seals, crustaceans, &c. They are gregarious in habits, and frequent the coasts of the Arctic and Antarctic Seas. They are exceedingly courageous and fierce when attacked. Each female produces but a single young one at a birth, and the mothers are very attentive to their offspring.

**WALSALL**, a parl., county, and municipal bor. of England, in Staffordshire, 8 miles N.N.W. of Birmingham, on a limestone ridge, above a stream of same name which joins the Tame a little below, and on the London and North-Western, Midland, and South Staffordshire Railways. The environs present much fine scenery, and the town itself contains numerous spacious streets, and is rather handsomely built. The chief buildings and establishments are a modern parish church, with tower terminating in a lofty spire, and other places of worship; a free grammar, blue-coat charity, and other schools; a town-hall and jail; a public library and news-room; three theatres; a hospital for medical and surgical cases; county court, a handsome structure with a Doric colonnade; alms-houses and other charitable endowments; a technical school; and there are also four public parks. A new town-hall and municipal buildings have been erected. The situation of the town gives it great advantages for carrying on the iron manufacture, which accordingly forms a leading industry; the chief articles consisting of ironmongery, including coach and carriage harness mountings, buckles, chains, locks, keys, screws, files, edge-tools, gas-tubes, &c. Saddlery and harness are extensively made, and are the staple of the town. There are also brass and iron foundries, machine-shops, tanneries, and establishments for currying, dyeing, and japanning hides, malt-works, and clothing-factories; and in the vicinity extensive lime-works, and both coal and iron pits. Walsall is of considerable antiquity, but the existing town is almost entirely of modern origin. It returns one member to Parliament. The devoted labours of Sister Dora (sister of Mark Pattison) in the town are commemorated by a fine statue. Pop. in 1891, 71,791; in 1901, 86,440.

**WALSHAM**, NORTH. See **NORTH WALSHAM**.

**WALSINGHAM**, SIR FRANCIS, an eminent English statesman, was born at Chislehurst, Kent, apparently in or about 1530, of a good family settled in that quarter. He studied at King's College, Cambridge, and travelled on the Continent until early in the reign of Queen Elizabeth. He was introduced to public service by Cecil. His first embassy is said to have been to France about 1561. He resided in France as ambassador from August, 1570, to April, 1573, and on his return was made principal secretary of state and a privy-councillor, and soon after knighted. In 1578 he was ambassador to the Netherlands, in 1581 to France, and in 1583 to Scotland. After having the chief direction of the measures for the discovery of Babington's conspiracy, he was appointed one of the commissioners for the trial of Queen Mary in 1586. He was afterwards

made chancellor of the duchy of Lancaster. He retired from public life some time before his death, which occurred at his own house in London on 6th April, 1590. It is somewhat remarkable that so little is known of Walsingham's career, but he worked in secrecy and dealt mainly in intrigue. He is said to have had fifty-three private agents and eighteen spies at foreign courts, and many stories are told of his diplomatic profundity. In his private character Walsingham is said to have been ascetically strict in his morals and puritanic in his religious zeal. An account of Walsingham's embassy to France appeared in a work by Sir Dudley Digges, entitled *The Complete Ambassador*, published in 1655, and a work entitled *Arcana Aulica* has been wrongly ascribed to Walsingham himself.

**WALTHAM**, a town of the United States, in Middlesex county, Massachusetts, on both banks of Charles River (which supplies abundant water-power), 9 miles west of Boston. It consists principally of a main street, and contains several fine churches and schools, a free public library; the factory of the American Watch Co., the largest establishment of the kind in the Union; extensive cotton-factories, and minor manufacturing establishments. Pop. (1880), 11,712; (1890), 18,707.

**WALTHAM-HOLY-CROSS**, or **WALTHAM ABBEY**, a market town of England, in the county of Essex, 12 miles north by east of London, on the left bank of the Lea. It consists chiefly of one irregular main street; and has a spacious Norman church, which once formed the nave of the church originally belonging to a famous abbey, and has a chapel connected with it and various interesting features. There are here government manufactures of gunpowder and percussion-caps, cordite, and small-arms, besides breweries, flour-mills, &c. The old abbey of Waltham was founded or enlarged by King Harold in 1060, and is said to have once possessed a fragment of the cross on which Christ suffered. In the neighbourhood are the village of Waltham Cross, and an 'Eleanor cross', an ornamental structure latterly completely restored. Pop. (1881), 5368; (1891), 6066; (1901), 6547.

**WALTHER VON DER VOGELWEIDE**, one of the most eminent old German lyric poets of the class of *Minnesingers*, was descended from a noble but not wealthy family, whose castle, Vogelweide, is supposed to have been situated in Tyrol. Walther resided at the court of Frederick, the eldest son of Leopold VI., duke of Austria, and on Frederick's death in 1198 he seems to have left the court of Vienna and entered on a series of wanderings. He seems to have remained longest at the splendid court of the Landgrave of Thuringia, who had always around him a circle of poets, and instituted that celebrated poetic contest, the war of the Wartburg (1207), in which Walther took part. Walther shows himself, in his political poems, a warm defender of the imperial power against the encroachments of the clergy and their head in Rome. The Emperor Frederick II. was also a patron, and bestowed on him a small fief. He died probably about 1230. His poems, all of which are lyric, have been published by Lachmann and others.

**WALTON**, IZAAK, famous as the author of *The Compleat Angler*, was born at Stafford on August 9, 1593. After receiving a school education in his native town he went to London and was apprenticed to an ironmonger. In 1618 he was made free of the Ironmongers' Company, and he seems to have retired with a competency in 1644. He early became closely acquainted with Dr. John Donne, Sir Henry Wotton, and other famous men; and was a strong royalist and the friend of prominent royalists.

After the Restoration he lived chiefly with George Morley, bishop of Winchester, and on Dec. 15, 1683, he died at his son-in-law's house in Winchester, a daughter of his having married a prebendary of Winchester. His first wife was a descendant of Archbishop Cranmer, and his second a half-sister of Bishop Ken. Walton's fame rests on *The Compleat Angler*, or the *Contemplative Man's Recreation: Being a Discourse of Fish and Fishing*, not unworthy the perusal of most Anglers. It was published in 1653, and went through five editions in his lifetime. The fifth edition, issued in 1676, contained, as a second part, Charles Cotton's treatise on fly-fishing, written to correspond with Walton's, and designated *Instructions how to Angle for Trout or Grayling in a Clear Stream*. The chief subsequent editions are those by Moses Browne (1750), Sir John Hawkins (1760), Major (1824), Sir Nicholas Harris Nicolas (1836), Ed. Jesse and H. G. Bohn (1856), R. B. Marston (1888), J. E. Harting (1893), and Andrew Lang (1896). There is a facsimile reprint of the first edition by Elliot Stock. Walton also wrote almost equally famous biographies of John Donne (1640), Sir Henry Wotton (1651, in *Reliquiæ Wottonianæ*), Richard Hooker (1665), George Herbert (1670), and Robert Sanderson (1678). The first four were published together in 1670, and have been often reissued, as, for instance, under the editorship of A. H. Bullen (1884) and Austin Dobson (1898). Besides the short pieces of poetry in his works, Walton wrote other occasional and prefatory verses, which are to be found in R. H. Shepherd's *Waltoniana* (1878). The charm of *The Compleat Angler* is due to its purity and simplicity of style, the ease and unaffected humour of the dialogue, and its exquisite pictures of natural scenery, combined with the picture that it presents us of the writer's own sunny and benevolent nature. See the lives of Walton in Nicolas's and Marston's editions of his chief work, and the article in the *Dictionary of National Biography*.

WALTZ, a dance executed by any number of couples, the gentleman having his arm round his partner's waist, the couple wheeling round on an axis of their own, and at the same time moving round the room. The music is written in triple time in crotchets or quavers, and consists of eight or sixteen bar phrases. The *valse à deux temps* is a form of waltz now commonly danced, in which two steps are made to each bar of three beats. Compositions in waltz form are often not intended for dance tunes.

WANDERING JEW. See JEW (THE WANDERING).

WANDEROO (*Macacus silenus*), an Indian monkey of considerable size, with a conspicuous white mane of hair round its face, said to be very cunning. It is allied to the Rhesus Monkey (which see, and see MONKEYS).

WANDSWORTH, a metropolitan and parliamentary borough and parish of London, on the south side of the Thames. The parliamentary borough consists of the civil parishes of Wandsworth, Putney, Streatham, and Lower Tooting or Tooting-Graveney, and is bounded on the north by the Thames (separating it from Fulham) and by Battersea and Clapham, on the east by the Norwood division of Lambeth parl. bor., and on the south and west by the county of Surrey. The metropolitan borough includes also the parish of Clapham, which belongs to the parliamentary borough of Battersea and Clapham. Wandsworth proper is situated close to the Thames, near the mouth of its small tributary the Wandale, and is built between and on the slopes of two hills. New Wandsworth, a suburb of recent growth, lies to the east, and south of both stretches

Wandsworth Common, beside which are the Surrey county prison, the county lunatic asylum, &c. There are many important industrial establishments. Pop. of metrop. bor. in 1891, 155,524; in 1901, 232,030; of parl. bor. in 1891, 113,244; in 1901, 179,882.

WAPITI. See DEER.

WAPPING, a commercial district of London, in the parl. bor. of Tower Hamlets, containing docks, warehouses, &c. See LONDON.

WAR. The last resort for the settlement of disputes is the appeal to physical force, whereby the weaker is either compelled to yield to the demands of the stronger, put to flight, or, in the last extremity, slain. War is resorted to either for advantage or for vengeance. The one party possesses something which the other has resolved to seize, or has inflicted some real or supposed injury on the other, which he determines to punish by the infliction of a corresponding chastisement. War and law are quite opposed to each other, but while opposed they are also related. The ultimate means of enforcing law is by physical force, but in every society the aim of law is to put down every appeal to force except on the part of the magistrate, and equally to restrict his use of it to the enforcement of the law. Where there is no organized society every individual family, or group, enforces its own claims, and appeals to force are consequently frequent, but as society extends its organization these partial appeals to force are declared illegal and put down. But the society, however extended, is still partial; outside of it exist other societies with independent laws and different interests. Between these, disputes are liable to arise, which, failing mutual accommodation, can only be settled by force. In each society, moreover, the central authority is liable to vicissitudes of strength. When it is active and vigorous, the whole society is kept in equilibrium and repose; when it is weak or idle, private or party interests assert themselves, the laws are disobeyed, and the central authority may be defied and overthrown. Thus, three conditions of warfare arise according to the degree of organization of society: the state of private war, when no great central authority has been established, or when it has been wholly destroyed; the state of civil war, when such an authority, having been established, has decayed, and the society arranges itself in different parties for the purpose of maintaining the old, or establishing a new central authority; and the state of international war, when states sufficiently powerful to control their own subjects quarrel among themselves. In each of these states war is continuous with and opposed to law. The aim of law is always to control war, and either suppress it or render it subservient to its own enforcement or re-establishment; the aim of war is either to supplement the impotence of law, or accomplish some object forbidden by it. Hence the peculiarity of all laws relating to war. They are fluctuating in their nature, because the power to enforce them is frequently wanting; yet they are necessary, and in the end efficacious, because force can be applied in favour of law as well as against it, and it commonly becomes the interest of society in the long run so to apply it. It follows also from these conditions that as there are three states of warfare, so there are three relative states of law opposed to them: international law is opposed to international war, national law to civil war, and natural law to private war. In each case, law forms the boundary of war and war of law, so that where one is strong the other is weak. International law may thus be defined as consisting of those common principles which still continue to be recognized and observed by belligerents. The persistent disregard of any principle of law by a belli-

gerent would annihilate it as a principle of international law, and as the belligerent has already set the power of its immediate antagonist at defiance, the only considerations which can enforce its observance of an international law are its own respect for its principle, or its fear of the power of neutrals. In like manner national law is opposed to and limits civil war. In as far as either party sets the national law at defiance the law is abrogated and can only be re-established by force; in as far as it is observed it controls the action of both parties. Private war is opposed by natural law because there is no positive law recognized by the parties. Violence is limited only by the power or conscience of the belligerents. But where the central power is not wanting, but weak, private war comes partly under the control of positive law. This was the case in feudal Europe. Private war was legally sanctioned in those feudatories who were too powerful to be controlled by the central authority, but was put under numerous restrictions which were disregarded when the feudatories were strong and made more absolute as they became weaker. The church also lent its aid to suppress private war by peculiar regulations of its own. See TRUCE OF GOD.

WAR, PEASANTS'. See PEASANTS' WAR.

WARBECK, PERKIN. See HENRY VII.

WARBLERS (Sylviade), the name applied to a family of Dendrostrafal Insectores, distinguished by the bill being of moderate length and of slender make, broad at the base and tapering towards the extremity. The tip of the upper mandible is curved downwards, and is slightly notched. The nostrils open at the base of the bill in a membranous goove, their opening being uncovered. The wings are elongated, the tarsi being long and slender, and the outer toe united to its neighbour digit at the base. The family includes a variety of sub-families and a large number of genera. The typical group of the family is that of the Sylvins or True Warblers, sometimes also named Lusciniæ. To this group belongs the genus *Sylvia*, represented by such forms as the White-throat (*Sylvia undata*), the Garden Warbler (*S. hortensis*), the Chiff-chaff (*S. rufa*), the Willow Warbler (*S. trochilus*), the Brake Warbler (*S. Curruca*), the Wood Warbler (*S. sibilatrix*), the Blackcap Warbler (*S. atricapilla*), and other equally notable species. The species of the genus *Sylvia* possess a few weak bristles at the base of the bill. The wings have the first quill short and the third and fourth quills longest. The hinder toe has a strong claw. The Garden Warbler or White-throat and the Brake Warbler or Lesser White-throat are noticed in the article WHITE-THROAT. The Chiff-chaff is a small species, attaining a length of 4 or 5 inches. Its colour is brown on the upper and white on the under parts. It inhabits woods and thickets, and destroys large numbers of insect larvae, especially those of the Oak-green Moth. It arrives in England in March and migrates southward in October. The Chiff-chaff derives its name from its cry. The Willow Warbler or Yellow Wren is coloured an olive-green above, the throat and chest being white, with a yellowish tint; whilst the belly is pure white. Its average length is 5 inches. This bird feeds on insects, and inhabits the same localities as the preceding species. The eggs are five to seven in number, and are of gray-white colour, spotted with red. The Wood Warbler may be known by the yellow streak over the eye, and by the green colour of the upper parts; the under parts being pure white. This bird feeds chiefly on the 'Leaf-rolling Caterpillars' and on other insects, which it pursues on the wing. Its length is about 5 inches. The nest is built on the ground, and is ingeniously constructed

of hair and grasses, lined with moss. The Blackcap Warbler is the nearest rival of the closely-related nightingale in the sweetness of its song. (See BLACKCAP.) The Grasshopper Warbler belongs to the genus *Calamodytes*, and is named *C. locustella*. Its cry is not unlike that of the grasshopper; and its colour is a greenish-brown, the under parts being pale brown. The average length is 5½ inches. The food consists of insects. The nest is artfully concealed, and is formed of grasses, &c. The Sedge Warbler (*C. phragmitis*) is an allied species, and is so named from its habit of diving into reeds and grasses when disturbed. Like the Grasshopper Warbler it arrives in England in April and leaves again in September. Its colour is brown above and white on the throat, the abdomen being of a buff colour. The average length is 4½ inches. The eggs number four or five; and the colour is a yellowish-brown, with darker brown spots. The genus *Salicaria* includes the *S. ciaticola* or Fan-tail Warbler of the Mediterranean coasts and of North Africa and West Asia. It is common at Gibraltar, and is coloured a chestnut or ruddy brown above, the under parts being white with a brown tint. The tail is brownish-black, each tail-feather being tipped with white. The length of this bird, which derives its name from the fan-like spread of its tail, is 5 inches. The nest is made of leaf-blades and grasses ingeniously sewed together. The eggs, numbering four or five, are of a blue tint laid on a cream-coloured ground.

WARBURTON, WILLIAM, a celebrated English prelate, was born at Newark-upon-Trent, in Nottinghamshire, in 1698. He was the second son of an attorney, and in 1714 commenced the study of law. After completing a clerkship of five years he was admitted in one of the courts at Westminster, and, returning to Newark, he engaged in legal practice. Not finding the profession adapted to his taste or talents he relinquished it, and in 1723 took deacon's orders in the church. In 1726 he visited London, and formed an acquaintance with some of the inferior wits of that period, among whom was Theobald, to whose edition of Shakspeare he contributed. In 1727 he began to distinguish himself as an original writer by his inquiry into the Causes of Prodiges and Miracles, which he dedicated to Sir Robert Sutton, who presented him to the rectory of Brant Broughton, in Lincolnshire, where he remained several years, composing here most of those works which contributed to the establishment of his fame. In 1736 appeared his Alliance between Church and State, or the Necessity and Equity of an Established Religion and Test Law, which passed through four editions during the life of the author, though it is said to have given satisfaction neither to the zealots of the church nor to the advocates for religious liberty. The first volume of his chief work was published in 1737, under the title of The Divine Legation of Moses demonstrated on the Principles of a Religious Deist from the Omission of the Doctrine of a Future State of Rewards and Punishments in the Jewish Dispensation. This paradoxical performance met with adversaries among all parties, who concurred in criticizing and censuring the theory on which it is founded. He replied to his critics in a vindication of his opinions, and persevered in the prosecution of his work. Having published in the journal called the Works of the Learned, in 1739 and 1740, a defence of the Essay on Man against the remarks of De Crousaz of Geneva, Pope acknowledged his obligations to his advocate, and an intimacy ensued between them. On his death in 1744 Pope bequeathed to our author half his library, and the copyright of such of his works already printed as were not otherwise disposed of. Among the

numerous antagonists of Warburton and his Divine Legation were Doctors Middleton, Pococke, and Stebbing, against whom he published, in 1744 and 1745, two defences, in which he treats all his opponents, except Middleton, with a high degree of asperity and self-confidence. He became, in 1746, preacher to the society of Lincoln's Inn; and in the following year he appeared as the editor of Shakspeare, and proved himself to be but a poor commentator. In 1750 appeared his *Julian, or a Discourse concerning the Earthquake and Fiery Eruption* which defeated that Emperor's Attempt to rebuild the Temple, elicited by Middleton's Inquiry concerning the Miraculous Powers of the Christian Church. He now rapidly advanced in the course of preferment in his profession, becoming prebend of Gloucester in 1753, king's chaplain-in-ordinary in 1754, then prebend of Durham, D.D., dean of Bristol in 1757, and two years after Bishop of Gloucester. In 1768 he established a lecture at Lincoln's Inn on the evidence in favour of Christianity from the prophecies of the Old and New Testaments. The last years of his life were embittered by the loss of an only son. Bishop Warburton died at Gloucester, June 7, 1779, and was interred in the cathedral church, where a monument was erected to his memory. His works were collected and published by his friend Bishop Hurd in 1788 (six vols. 4to); and a biographical memoir, forming a seventh volume, appeared several years after. A valuable life of this rather quarrelsome and arrogant churchman was published by the Rev. J. S. Watson (London, 1863). See Mark Pattison's *Essays* (1889).

WARD, EDWARD MATTHEW, historical painter, son of a banker, was born in Pimlico on July 14, 1816. He gave evidence of artistic ability at an early age, and when only fourteen years old he was awarded a prize by the Society of Arts. His first regular studies in art were pursued in the studio of John Cawse, in London, and in 1835 he entered the Royal Academy schools. During the three years 1836-39 he was abroad, at first in Paris and Venice, but latterly, and for the greater part of the time, in Rome, where he was a pupil of Cavaliere Filippo Agricola, director of the Academy of St. Luke. On his way home to England he studied fresco-painting with Cornelius at Munich. He had exhibited as early as 1834, but his first noteworthy picture was that of Cimabue and Giotto, which he sent to the Royal Academy in 1839. From that time he was a regular contributor to the Academy's annual exhibition, and in 1855 he was elected one of the forty academicians, after having been an associate for eight years. He was unsuccessful with a cartoon, *Boadicea animating the Britons*, which he sent to the Westminster Hall competition in 1843, but in 1853 he was commissioned to paint eight historical pictures for the corridor of the House of Commons. The result of this commission was his eight fresco pictures—*The Execution of Montrose*, *The Last Sleep of Argyll*, *Alice Lisle concealing Fugitives*, *Monk declaring for a Free Parliament*, *The Escape of Charles II. with Jane Lane*, *The Landing of Charles II.*, *The Acquittal of the Seven Bishops*, and *William and Mary receiving the Lords and Commons*. He died at Slough on Jan. 15, 1879, from the effects of a self-inflicted throat wound. Ward's oil-paintings were mainly historical, but some of them depicted incidents and phases of English life in the eighteenth century. Among the best of them are: *Napoleon in the Prison of Nice in 1794* (1841); *Cornet Joyce seizing the King at Holmby, 1647* (1841); *Dr. Johnson reading the Manuscript of the Vicar of Wakefield* (1843); *A Scene from the Early Life of Goldsmith* (1844); *A*

*Scene in Lord Chesterfield's Ante-room in 1748* (1845), now in the Tate Gallery; *The Disgrace of Lord Clarendon* (1846), of which there is a replica in the National Gallery; *The South Sea Bubble* (1847), now in the National Gallery; *Charles II. and Nell Gwyn* (1848), in the South Kensington Museum; *James II. receiving the News of the Landing of the Prince of Orange at Torbay* (1850), now in the National Gallery; *The Royal Family of France in the Temple* (1851); *Charlotte Corday going to Execution* (1852); *Napoleon III. being invested with the Order of the Garter at Windsor* (1857); *The Visit of Queen Victoria to the Tomb of Napoleon I.* (1857), like the previous one commissioned by Queen Victoria; the *Ante-chamber at Whitehall during the dying Moments of Charles II.* (1861); *Hogarth's Studio*, 1739 (1863); *Luther's First Study of the Bible* (1869), now owned by the British and Foreign Bible Society; *The Eve of St. Bartholomew* (1873); *Marie Antoinette in the Conciergerie* (1874); *Lady Teazle* (1875); and *The Last Interview between Napoleon I. and Queen Louise at Tilsit* (1877). Many of these are well known in engravings. He married a granddaughter of James Ward, the painter and engraver (see next article). See the *Life and Works of E. M. Ward*, by Dafforne (1879).

WARD, JAMES, painter and engraver, was born in London on Oct. 23, 1769. He studied the engraver's art with great success in his boyhood and also early turned his attention to painting, and when only twenty-five years of age he was appointed painter and mezzotint engraver to the Prince of Wales, afterwards George IV. He was elected associate of the Royal Academy in 1807, and full academician in 1811. He died at Cheshunt on Nov. 23, 1859. Ward first exhibited a painting in 1790, and from that time to his death he produced numerous pictures of different types, though his best work was done in the painting of animals. His most important works are: *Bull-baiting* (1797); *The Alderney Bull, Cow, and Calf in a Meadow* (1820-22), his master-piece, now in the National Gallery, painted in rivalry with Paul Potter's celebrated master-piece; *Allegory of Waterloo* (1817), a sketch for the British Institution which he afterwards painted larger with less success; *Gordale Scar, Yorkshire*, in the National Gallery; *Harlech Castle*, also in the National Gallery; *Regent's Park in 1807*; *A Cattle Piece*, also in the National Gallery; *Bulls Fighting in a Landscape*, a work of great merit, now in the South Kensington Museum; *Donkey and Pigs*, also in the museum at South Kensington; *Pigs*, and *A Chinese Sow*, in the same collection; *The Council of Horses*, in the Manchester Gallery; and *De Tabley Park*, in the Oldham Gallery. Among his engravings the most noteworthy are after Rembrandt, Hoppner, Rubens, Northcote, Morland, and Reynolds. George Morland, the painter, was married to a sister of Ward, and Ward's elder brother William (1766-1826), a skilful engraver, was the husband of Morland's sister. James Ward's son, George Raphael Ward (1798-1878), attained some fame as an engraver of portraits, and William Ward's son, Martin Theodore Ward (1799-1874), was known as an animal painter. A daughter of George Raphael Ward became the wife of E. M. Ward, the painter (see preceding article).

WARD, WILLIAM GEORGE, Tractarian leader and Roman Catholic theologian, son of a banker and Tory member of parliament, was born in London on March 21, 1812. Educated at Hammersmith and in Winchester College, he entered Christ Church, Oxford, in 1830, obtained a scholarship at Lincoln



College in 1833, graduated B.A. in 1834, and about the same time secured election to a fellowship at Balliol. He took orders, and became a lecturer in mathematics and logic. Ward soon became a powerful influence in Oxford life, especially on its religious side, among those who were more or less affected by him being Archbishop Tait, Benjamin Jowett, Dean Stanley, and the poet Clough. He in turn was profoundly influenced by John Henry Newman, whose famous Tract 90 he supported in two pamphlets. The publication, in 1843, of William Palmer's Narrative of Events connected with the Publication of Tracts for the Times produced from Ward in reply his famous work entitled *The Ideal of a Christian Church considered in comparison with existing Practice* (1844), and the formal condemnation of this book by the university authorities precipitated Ward's reception into the Roman Catholic Church (1845), where he was soon followed by Newman and other Tractarians. In 1851 he became lecturer in moral philosophy in St Edmund's College, Ware, and in 1854 the pope gave him the diploma of Ph.D. He resigned his lectureship in 1858, and in the columns of the *Dublin Review*, which he edited during 1863-78, he contended vigorously on behalf of ultramontane principles. He was a founder and leading member of the remarkable Metaphysical Society. He died at Hampstead on July 6, 1882. In addition to the works already mentioned Ward wrote: *On Nature and Grace* (1860); *Essays on the Philosophy of Theism* (1884), a work of great ability; and many smaller works. See William George Ward and the Oxford Movement (1889) and W. G. Ward and the Catholic Revival (1893), both by his son Wilfrid.

**WARDEN**, the name of various officials. The heads of All Souls, Keble, Merton, Wadham, and New Colleges at Oxford are known as wardens. The Warden of the Cinque Ports (see CINQUE PORTS) is an official with merely nominal duties now, though he was formerly of much importance. Wardens of the Marches were formerly appointed to keep the disturbed border counties of England in a state of defence. Certain municipal officers in Connecticut and Rhode Island also bear this name. See also CHURCHWARDENS.

**WARDLAW, RALPH**, an eminent clergyman of the Independent persuasion, was born at Dalkeith on 22nd December, 1779, but six months after his birth was removed with his parents to Glasgow. His mother was the granddaughter of Ebenezer Erskine of Stirling, the founder of the Secession Church, and he himself studied divinity with the view of becoming a minister of that body. But having been led to change his views on the subject of ecclesiastical polity he embraced the principles of the Independents. Having properly qualified himself for the sacred office he was inducted in 1803 to the charge of a chapel in North Albion Street, Glasgow, where he continued for sixteen years, and from thence removed with his congregation to a larger building in West George Street, where he officiated to the close of his life. In 1811 he was appointed professor of systematic theology in the newly-established Congregational seminary in Glasgow. Both as a lecturer and as a preacher his abilities were of the first order, displaying as their leading characteristics the qualities of solid, logical reasoning, earnestness of purpose, and the elegance of a refined taste. Of his numerous publications, we may mention *Discourses on the Socinian Controversy* (1814); *Essays on Assurance of Faith, and Extent of the Atonement and Universal Pardon* (1830); *Christian Ethics* (1832); *National Church* Vol. XIV.

*Establishments examined* (1839); *Lectures on Female Prostitution* (1842); and *Congregational Independency* (1847). Dr. Wardlaw died near Glasgow on 17th December, 1853. He received the degree of D.D. from Yale College in 1818.

**WARE**, a town of England, in the county of Hertford, 2 miles S.W. of Hertford, in a valley, on the banks of the Lea. It contains a Perpendicular parish church (restored), with interesting monuments; various other places of worship; a town-hall; a grammar-school; &c. The chief industries are brick-making, and especially malting. The great bed of Ware, a huge structure of 12 feet square, mentioned by Shakspeare, has been removed from an inn of this town to the Rye House, a place of entertainment about 4 miles distant. Pop. (1891), 5256; (1901), 5573.

**WAREHAM**, a municipal borough and market-town of England, in Dorset, situated between the rivers Piddle and Frome, near their mouths in Poole Harbour. The town is laid out on the rectangular plan, and is inclosed on three sides by earth ramparts of great antiquity. It has three ancient churches, two of them now disused, remains of an ancient priory dedicated to the Saints Mary, Peter, and Ethelwold; a town-hall and corn-exchange; &c. It has a large brewery and a trade in various kinds of clay. Wareham was formerly a two-member parliamentary borough, but in 1885 the single member left to it by the act of 1832 was withdrawn. It occupied a prominent place in history for many centuries. Pop. in 1891, 2141; in 1901, 2003.

**WAREHOUSING SYSTEM**, the system by which goods liable to excise or customs duty are kept in warehouses without the duty being paid on them till they pass to the consumer or the retail dealer. In Britain, before the adoption of this system, importers of goods liable to duty were obliged to pay duty on the whole of the goods imported on arrival, or to give a bond with security to the customs for the subsequent payment of the duty. If goods which were liable to duty on importation were afterwards re-exported, a drawback equivalent to the duty paid was allowed. This system was inconvenient to the importers in compelling them to invest a large capital in duties on goods which might remain for an indefinite period unsold in their warehouse, and it subjected the revenue to the liability of fraudulent claims for drawbacks. The object of the warehousing system is to enable importers of goods which are liable to duty to store the goods on arrival at their destination, re-export them if desirable without paying duty, or take delivery of them from time to time for home consumption by paying duty on the quantity required. The adoption of a warehousing system formed part of the excise scheme of Sir Robert Walpole in 1733, but the merchants of that day opposed it, it is said, because it interfered with the abuse of drawbacks, and it was withdrawn. The foundation of the present system was laid in 1803 by the statute 43 George III. cap. cxxxii. After numerous modifications and amendments it was remodelled by the Customs Consolidation Act, 18 and 17 Victoria, cap. cvii., which has also been amended by various subsequent statutes, particularly 23 and 24 Victoria, cap. xxxvi., and 39 and 40 Victoria, cap. xxxvi. We shall give a brief outline of the general working of the system both in its legal and commercial aspects. Goods liable to duty are warehoused in a bonded warehouse, and are called goods in bond. The ports at which particular kinds of goods may be warehoused are determined, but the system has been gradually relaxed so as to admit of every important port being used for warehousing, and even important inland towns are admitted as warehousing centres.



The warehouse is kept by a bonded-store keeper, who gives a bond of sufficient value, and with satisfactory security to the government for the performance of his duties. When goods are warehoused by an importer in a bonded store they may be transferred by an order, addressed by the importer to the store-keeper, to any other person, the new owner assuming the responsibilities of the importer. Goods in a bonded store are always open to the inspection of the officers of customs, and can only be inspected by the owner in presence of the proper officer. Any importer who fraudulently gains access to goods stored by him without the presence of the proper officer is liable to a penalty of £100. Goods must be stored and remain in store in their original packages, unless when permission is given before or after storing to sort or repack them. Any infringement of this regulation, or of the regulations for storing or removing goods, subjects to heavy penalties, commonly to the forfeiture of the goods. Goods under bond may on application be removed at the expense of the owner as often as required from one warehouse to another, or by coast, or inland carriage, from one port to another, being stored on the same terms in the new port or warehouse as in the old. The warehouse-keeper is bound to store the goods so that easy access can be had to each package, under penalty of £5 for each offence. He is liable to a like penalty for neglecting to produce any package when required by any officer of customs. The keeper of the warehouse is liable for the duty on any goods taken out of the warehouse without proper authority; but if goods are improperly removed by a customs-officer no duty is exigible, and the commissioners of customs, with the sanction of the commissioners of the treasury, may make good the loss of the owner. The commissioners do not make good any loss by fire, but they may remit duty on any goods accidentally lost or destroyed before or after warehousing. Goods which have been in warehouse for five years must be rewarehoused, or they will be liable to be sold.

**WARHAM, WILLIAM**, archbishop of Canterbury, was born in Hampshire about 1450. He was educated at Winchester school, and New College, Oxford, of which he became a fellow in 1475. He acted for a time as advocate in the Court of Arches and moderator of the civil law school at Oxford, and in 1493 he was ordained subdeacon. He was granted the living of Barley, Herts, in 1495, and that of Cottenham, near Cambridge, in 1500, and he held both till 1502, when he was consecrated bishop of London. From 1494 till 1502 he was master of the rolls. He was formally installed as archbishop of Canterbury in 1504, and about the same time he was appointed lord-chancellor after seventeen months' service as keeper of the great seal. From 1506 till his death he was chancellor of Oxford University. He performed the ceremony of coronation in 1509, after the accession of Henry VIII., and in 1515 he was succeeded by Wolsey in the lord-chancellorship. When Wolsey had been raised to the dignity of papal legate there was much friction between him and Warham in their official capacities. Warham's action in regard to the divorce question was very weak and subservient, but shortly before his death, which occurred on Aug. 22, 1532, he made a protest against the acts of the parliament undermining the papal authority. In his earlier years he was much employed on foreign embassies.

**WARKWORTH**, a seaport of England, in Northumberland, on the river Coquet, near its mouth, 6 miles south-east of Alnwick. It is a small village, with an ancient church (restored) of much interest, the ruins of a Benedictine priory, a twelfth-century

castle, and a famous hermitage, partly hewn out of the rock. Pop. about 700.

**WARMING AND VENTILATION.** Warming and ventilation are closely allied, and they are generally treated in conjunction. Man is so constituted that his body is dependent on the materials with which he is surrounded for nourishment and support; and probably no subject connected with the health and vigour of the mind, as well as of the body, deserves more and has received less attention than the condition of the internal atmosphere of our houses and apartments. In private dwellings it often seems as if ventilation were not considered necessary. As Dr. Birkbeck remarked, in his evidence before a committee of the House of Commons, 'heating and ventilation, especially the latter, seldom enter into the mind of the builder when he projects his building; he begins as if he did not know that ventilation could be necessary; he trusts to the doors and to the windows, to neither of which belongs the business of ventilation'. Again, Faraday remarked that 'the builder makes the doors and the windows to fit as tightly as possible, and then the poor chemist is called in to provide fresh air'. But if the contaminations and impurities that exist in the air of unventilated inclosures could be seen by the eye, the evil would not be endured. Constant supplies of pure air are even more needful for health than the artificial warmth by which the rigours of our uncertain climate are mitigated. Various diseases have been referred to the breathing of impure air, and a large proportion of our ailments originate in our imperfect modes of warming our dwellings. Statistical reports laid before parliament by the war office on the sickness and mortality of the troops of the United Kingdom stationed in different parts of the world, have proved clearly the effect upon human life produced by small and nearly inappreciable differences in the quality of the atmosphere. On the same class of persons, performing the same duties and placed as nearly as possible in the same circumstances, the average mortality varied in different parts of the world from  $1\frac{1}{2}$  per cent per annum to 67 per cent.

The unequal distribution of solar heat over the earth is the cause of notable differences in national character; and where an artificial indoor climate is required, the comparative facility with which fuel is procurable has a great effect in promoting or interfering with the health and personal comforts of nations, and these react upon and contribute to form the character. The county of Bucks was formerly overgrown with wood, and it was thought necessary to clear it away, as it had afforded refuge to numerous robbers infesting the district. The people, thus deprived of fuel, became in the course of time stunted in growth and dulled in intelligence, until, by the extension of inland navigation, fuel was cheapened, and the inhabitants improved. In Lancashire, on the contrary, the abundance and cheapness of fuel were extremely favourable to health and comfort, and hence, according to Sir Gilbert Blane, the inhabitants of this county, particularly the females, became noted for their well-formed persons and handsome features.

In settling the supply of fresh air necessary for the proper ventilation of apartments, it may be remarked that the proportional quantity of carbonic acid in the air may be taken as an index to its general character for purposes of respiration. Atmospheric air consists of oxygen and nitrogen in the proportion of about 1 to 3 by weight, or 1 to 4 by volume, so that in 10,000 volumes of air there are about 2500 volumes of oxygen and 7500 volumes of nitrogen. In addition to these, the essential elements, there is

present, according to the investigations of Dr. Angus Smith, a very small quantity of carbonic acid, from 3 to 4 volumes in 10,000 volumes of air. The proportion, nevertheless, in many confined situations, greatly exceeds this ratio; for Dr. Smith found by analysis, that the atmospheres of the following localities contained the annexed proportions of carbonic acid:—

	Carbonic acid, volumes in 10,000 parts of air.
Streets of Manchester during a fog.....	6.3
Dress circle, Haymarket Theatre, 1864.....	7.6
Close buildings (average).....	16.0
Pit of the Theatre Royal, Manchester.....	27.3
Worst parts of theatres.....	32.0
Mines (average of 339 tests).....	78.5
Mines (largest proportion).....	278.0

Here the margin for excess is very wide. Dr. Letheby states that, with a proportion of 10 volumes of carbonic acid in 10,000 volumes of air—one-tenth of 1 per cent.—the atmosphere begins to get bad; but that there are many instances in which persons have lived, apparently without discomfort, in atmospheres holding considerably more than 15 volumes of carbonic acid in 10,000 of air. He gives the following cases:—

The Court of Chancery contained.....	19.3 volumes.
The Chamber of Deputies in Paris.....	25 "
The London theatres.....	10.2 "
The Paris theatres.....	23 to 43 "

The wide range of these proportions of impurity in the atmosphere, measured by the quantity of carbonic acid, clearly demonstrates that the human frame possesses a great power of adapting itself to various conditions of the atmosphere. It is, however, necessary, in order to the maintenance of sound health, that special provision be made, by ventilation, for changing the air of apartments, and supplying plenty of fresh air for respiration and other wants of the system; for it is to be remembered that the poisonous gas carbonic acid is produced, not only by the combustion of charcoal, gas, oil, or candle, but likewise by respiration, which is in reality a species of slow combustion. A male adult makes twenty respirations per minute, and according to Dr. Reid, inhales 16 cubic inches of air at each inspiration, and discharges by expiration,  $1\frac{1}{2}$  cubic inches of carbonic acid gas, together with a small quantity of watery vapour, diluted, of course, with air rejected from the lungs. The nett quantity of air thus inhaled and destroyed or contaminated, amounts to 320 cubic inches, or nearly  $\frac{1}{4}$ th of a cubic foot per minute. In addition, there are vapours discharged from the skin; and, in summing up the various items of demand for air, it is found that, the minimum quantity of air that should be provided for the ventilation of apartments is from  $3\frac{1}{2}$  to 5 cubic feet per head per minute. This rate of supply is sufficient in the winter season; and it should be increased to from 5 to 10 cubic feet per minute in summer. With these proportions, according to Mr. Hood, the wholesomeness and purity of the atmosphere are maintained.

But, how is the proper degree of ventilation to be effected, without giving rise to draughts? This is the practical issue of the problem, and in conjunction with warming, it has been more or less a difficulty in systems of artificial ventilation. Let us see what Nature teaches that intelligent insect, the bee. Imagine, says Mr. Tomlinson, a dome-shaped building, perfectly air-tight, except through a small hole at the bottom, capable of containing 30,000 or 40,000 animals, full of life and activity,—every portion of the inclosed space that can be spared being filled with curious machinery—the problem is how to warm and ventilate such a space so as to maintain a proper temperature, and yet to give to every indi-

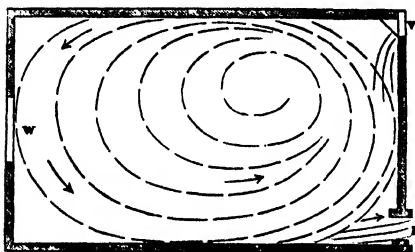
vidual within it a proper supply of air. Now this is the condition of a common bee-hive, in which there is absolutely no other door or window, or opening than through the small entrance opening. On taking possession of a new hive, the bees stop up all the cracks and chinks with a resinous substance named propolis, for the purpose of keeping out insect depredators. Huber, an enthusiastic and successful inquirer into the habits of bees, was struck by the constant appearance of a number of the workers arranged on each side of the entrance a little within the hive, incessantly engaged in vibrating their wings. On holding small pieces of paper, suspended by threads, before the aperture, the existence of two currents of air became evident:—a current of warm air was rushing out, and at the same time a current of cold air was rushing in. These two currents are established in the hive by the fanning motion of the bees' wings: inwards at one side of the entrance, and outwards at the other side; and thus the ventilation of the hive is effected.

The circumstances under which our rooms are placed are more favourable to ventilation than those of the bee-hive. Whether ventilation be left to chance, or whether any special apparatus be erected for the purpose, the foul air must be got rid of, and fresh air admitted in sufficient quantity. A good system of ventilation must have the effect of reducing the proportion of carbonic acid in the air as much as possible without producing the inconvenience of local draughts, or materially lowering the temperature. Openings not specially intended for the purpose of ventilation, such as chimneys, doors, and windows, nevertheless afford, under ordinary circumstances, natural passages for air, although there is no precise information as to the degree of ventilation effected by such means:—how much fresh air enters, and how much spent air issues, in a given time. It is commonly supposed that the warm carbonic acid formed by respiration, and by the combustion of lamps and candles, ascends and forms an atmosphere of impure air in the upper part of rooms not artificially ventilated at the top; so that persons breathing the air above the level of the opening to the chimney, breathed a more unhealthy air than those below such level. It is found, however, that gases, even if they be of various specific gravities, tend to become intermixed, and to be uniformly diffused throughout a space occupied by them in common. Roscoe's experiments have shown that there is no local accumulation of impure air in a room. But this conclusion does not hold with regard to the air in crowded and heated public buildings:—the air collected from the gallery of a crowded theatre was found to contain much more carbonic acid than the air that was collected from the pit.

The circulation of air in an apartment has been well illustrated by some experiments made by Mr. Campbell. He filled a small balloon with a light gas, and weighted it until it was nearly of the same density as the air in the stillest part of the room. When placed opposite to, and near the fire, as in Fig. 1 annexed, showing a room in section, the balloon expanded, ascended, and moved steadily along the ceiling from the fireplace towards one or other of the windows w, when it descended to the floor, moved towards the fireplace, and again ascended. If any one moved about the room, or if there were a draught from a door or window, or other slight disturbing cause, the direction of the balloon was somewhat altered. As the motion of the balloon indicates the motion of the air, it follows that the air near the fire must be continually ascending, and as it can neither escape nor accumulate at the ceiling, it must flow from the place where it ascends,

that is, from above the fireplace towards the windows and walls, when it is cooled, and consequently contracts and becomes heavier, falls by its own weight, and is forced downwards by fresh quantities of heated air, expanding and following in the same track. In like manner, because air cannot accumulate on the floor, the descending currents at the

Fig. 1.



windows, and those originating there from the coldness of the glass, must give rise to currents moving towards the fireplace near the floor, in the direction in which the balloon actually moves. If, then, the air of a room be circulating thus rapidly, foul air cannot accumulate in any great excess in any part of it, but, on the contrary, different qualities of air must be speedily mixed. It was further remarkable 'that the ventilator *v*, opening into the chimney, was not drawing air from the ceiling so as to interfere with the direction of the air passing close to and above it.'

'On warm days, when the sun shines on the carpet through the windows, and no fire is lighted, the currents are reversed. Those parts of the room where the carpet is warmed by the sun become the warmest. The air then ascends and flows from the windows along the ceiling towards the ventilator, which works freely, opening and shutting at short intervals. The air then enters the room by the chimney, and escapes by the door.' But when the fire is lighted the whole air of the room is in rapid circulation—much more so than when there is no fire, and the experiments seem to show that an open chimney with a fire lighted will serve to remove foul air from a dwelling-room, without any special opening communicating with the chimney from the upper part of the room.

The quantity of air that escapes from the room up the chimney is very considerable, and Mr. Campbell's experiments show that when persons are seated by the side of a comfortable fire, currents of air are constantly streaming over the surface of their bodies. No wonder that colds and rheumatic affections are so common in every household, under the usual arrangements of the fireplace, and that a cold will often run through the whole family at the end of autumn, when fires are begun for the winter.

For the ventilation of public buildings, as, indeed, for the ventilation of any building, it is advisable to make the aggregate area of the openings that admit the fresh air larger than the aggregate openings for the efflux of the vitiated air. This becomes necessary, notwithstanding the increase of volume which takes place in the heated and vitiated air. If the opposite course be adopted, and the eduction tubes be larger than the induction tubes, then a counter-current takes place in the hot-air or ventilating tubes, and the cold air descends through them; but by making the induction tubes numerous, and of a large total area, the velocity of the entering current is reduced, and unpleasant draughts are avoided.

In very hot weather, and with crowded assem-

blies, the draught is assisted in theatres and some other large buildings, by heating the air in the upper parts of the ventilating tube, which materially accelerates the upward currents, and increases the influx of fresh air. The heat of the large gasaliers in the centre of the house, near the ceiling of a theatre, is thus utilized for ventilation. Another mode of accelerating the draught, is to conduct the spent air into the lower part of a vertical shaft, where a furnace is maintained in active combustion, and a very hot column of air is maintained.

When the ventilation takes place by numerous apertures from below upwards, a supply of from 4 to 6½ cubic feet per minute maintains the air sufficiently pure; but in peculiar cases, as in hospitals, a supply of from 30 to 60 cubic feet of air per bed per minute is required. In the theatres of Paris a supply of 18 cubic feet of air per minute for each spectator is found to be sufficient. Care must, however, be taken to raise the temperature of the incoming air to the normal temperature of the inclosed space, and to distribute it in such a way as to prevent the currents from being perceived.

The temperature which is found the most agreeable for the air of apartments, in which the occupants are not engaged in bodily exercise, is from 63° to 65° Fahrenheit. The ordinary open coal-fire is, if not the most economical, at least the most agreeable means of heating apartments. The waste of heat is very considerable. It is estimated that the quantity of heat radiated into an apartment from a fireplace is about one-fourth of all the heat radiated by the combustibles; and it is only about a fifteenth part of the total heat generated by combustion when wood is the fuel, the remainder of the heat being carried off by the chimney. From coal or coke combustion in the fireplace, about one-eighth of the heat is radiated into the apartment; the rest is carried off. The large proportion of heat thus carried off is not entirely wasted, for it creates the draught which is necessary for the ventilation of the room. In burning wood, ordinary chimneys draw about 1600 cubic feet of air per pound of fuel; and better constructed chimneys draw about 1000 cubic feet.

By means of stoves, as may be expected, apartments may be warmed more economically than by ordinary fireplaces. From experiment, it appears that the proportions of fuel required to heat an apartment are, as 100 for ordinary fireplaces, 63 for metal stoves, and from 13 to 16 for apparatus similar to stoves, with open fires.

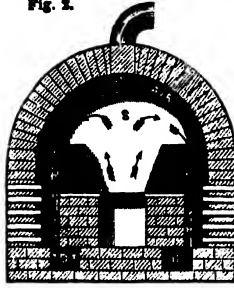
In France stoves are employed in schools and hospital-wards; they consist of an upright column, square or cylindrical, from 5 to 7 feet high, inclosing the furnace. They are surmounted by a pipe which rises vertically, and is then carried nearly horizontally through the apartment to a chimney. The column is inclosed in an outer casing of sheet-iron or brickwork, with an interspace into which the external air is admitted, and from the upper part of which the warmed air passes into the room. The area of heating surface of the stove amounts to from 20 to 30 square feet per pound of coal burned per hour.

The cockle-stove was applied by Mr. Strutt of Derby, in 1792, to warm his cotton factories. The fire chamber is cylindrical in form, with a flat or dome-shaped head, and a pipe leading from the upper part to carry off the smoke into the chimney. This iron fire-box, called a *cockle* from its shape, was placed on a bed of masonry or brickwork, with a grating and ashpit beneath. The cockle was enveloped in a brickwork shell, built round it, leaving an air-space between the cockle and the shell, into which a current of air

was admitted from passages underneath the stove, or from the external atmosphere. The air being heated and rarefied, ascended towards the head of the stove, and passed through one or more apertures into the room required to be warmed. The stove has also been known as the *Belper stove*, named after the place of residence of Mr. Strutt.

The cockle-stove erected by Mr. Charles Sylvester, for warming the Derby Infirmary, was long regarded as a model of its kind for a large building. It is constructed of wrought-iron plate  $\frac{1}{2}$  inch thick formed with an arch and two sides (see Fig. 2 below) closed at the ends,

Fig. 2.



through one of which the furnace-mouth is made. The furnace is formed of fire-brick, within the case, and the smoke is drawn off by flues below the furnace. The case is inclosed in fire-brick, with about 5 inches clear space for the circulation of the air to be heated. The air is introduced through the brickwork at the lower part of the sides, through numerous iron tubes, which are laid to within an inch clear of the sides of the case, and cause the fresh air to impinge upon the heated surface. The air passes upwards, and is ultimately led off at the top, and distributed in pipes where it is wanted.

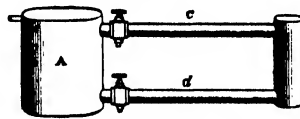
Hot water and steam, in pipes, are extensively employed for warming buildings. The first practical application of the principle of heating by radiation from metallic surfaces thus heated, was made by James Watt, in the winter of 1784-85, who fitted up an apparatus for warming his study. The room was 18 feet long, 14 feet wide, and 8 $\frac{1}{2}$  feet high. The apparatus consisted of a box, or heater, made of two side plates of tinned iron, about 3 $\frac{1}{2}$  feet long by 2 $\frac{1}{2}$  feet wide, united by stays and jointed round the edges by tinplate. This heater was placed on its edge, near the floor of the room. It was fitted with a cock for letting out the air, and was supplied with steam by a pipe from a boiler, entering at its lower edge; and by this pipe, also, the condensed steam returned to the boiler. The heating effect was not so great as was expected, perhaps, as Mr. Tomlinson suggests, in consequence of the bright metallic surfaces of the box not being favourable to radiation.

It appears that Mr. Hoyle of Halifax was the originator of the system of heating by steam-pipes. He obtained a patent in 1791 for heating rooms by this means, according to which the steam was at once conveyed from the boiler, by a pipe, to the highest elevation of the building to be heated, and from that point, by a gentle declivity, the condensed steam flowed into the supply-cistern of the boiler. Unlike hot-water apparatus, which retains its heating power for many hours, steam apparatus ceases to afford heat as soon as the fire fails to raise steam in the boiler. The boiler for a steam-heating apparatus should be capable of evaporating as much water in a given time as the pipes would condense in the same time. Mr. Hood recommends that six square feet of direct surface of boiler should be provided, to evaporate a cubic foot of water per hour. The steam generated from a cubic foot of water can be condensed in an hour, under ordinary circumstances, by 160 square feet of cast-iron pipe-surface. Pipes 4 inches in diameter are the best size for general heating purposes, and a length of 136 feet presents an area of

160 square feet. Finally, to find the length of 4-inch pipe required for heating the air in a building, by steam having a pressure of 5 lbs. per square inch above the atmosphere; multiply the volume of air in cubic feet to be warmed per minute, by the difference of the external and internal temperatures, and divide the product by 336.

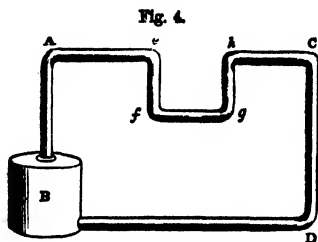
The heating of rooms by the circulation of hot water in pipes seems to have occupied the attention of a few speculative individuals long before the attempt was actually made. The first successful trial was made by Sir Martin Triewald, a Swede, who resided for many years at Newcastle-on-Tyne, and about the year 1716 described a method of warming a greenhouse by hot water. The water was heated outside the building, and conducted by a pipe into a chamber under the plants. Subsequently, in 1777, M. Bonnemain employed hot water circulating in a long series of pipes, for hatching chickens. Mr. Atkinson, in 1822, appears to have first succeeded in reducing the hot-water apparatus to its most simple and practical form. The circulation of water is brought about on the principle of the expansion of water by heat, and its greater levity in consequence. Whatever be the depth of the water above, the water when heated in the lower part of a boiler will rise to the surface, making room for other and colder particles to be heated in their turn; and if a pipe full of water rise from the top of a boiler to any required height, and then return by gentle bends to the boiler at the lower part, heated water will rise and occupy the straight pipe, and the colder water will descend into the boiler. Thus a continuous circulation may be maintained; for as the heated water ascends, it gradually parts with its heat, and the returning current is of necessity colder than the ascending current. The greater the elevation to which the heated water ascends, and the higher the initial temperature of the water, the greater is the motive power for circulation, or the difference of weight of the two columns of water. Suppose a boiler A (Fig. 3) to be 2 feet high, and the

Fig. 3.



distance from the top of the upper pipe *c* to the centre of the lower pipe *d* to be 18 inches, the pipes being 4 inches in diameter, and laid horizontally. The difference of pressure on the return pipe will be 163 grains, or about a third of an ounce, and this will be the motive power of the apparatus, whatever be the length of pipe attached to it. If such an apparatus have 100 yards of 4-inch pipe connected to it, and the boiler contain 80 gallons, all full of water, there will be 190 gallons, or 1900 pounds weight of water kept in continual motion by a force equal to only one-third of an ounce. With so very small a motive force available for circulation, it may be easily imagined that in laying down a system of hot-water pipes, careful arrangement and adjustment are required, in order that no lodgment of air may take place at any point, and thus break the current; that the frictional resistance to the passage of the water through the pipes be minimized; that the bends should be easy and regular; and that there be no obstruction in the pipes. A simple wood-shaving in the pipes has been known to arrest the current; and, such is the effect of friction, that the velocity of the current may not exceed a half or even only a ninth of that which would be impressed upon the water by gravity

if it were allowed unrestricted action. Every part of the apparatus where an alteration of level occurs must be furnished with a vent for air, to be opened and closed when necessary. For example, in an apparatus constructed in the form represented by Fig. 4 below, in which the upper pipe is depressed



at the middle of its length, the motion upwards through the boiler and the pipe *B A*, and downwards through the section *C D*, takes place in virtue of the difference of weight of the two columns, which are hot and cold with respect to each other; and, of course, as the return current passes along the lower pipe *D B* into the boiler, the outflowing current must traverse the siphon piping *A e f g h C*. But when a very small quantity of hot water has passed from the pipe *A e* down the pipe *ef*, the column of water *gh* will be heavier than the column *ef*, and the current will therefore tend to move along the upper pipe towards the boiler instead of from it; and unless the force producing motion in the descending pipe *C D* be sufficient to overcome this tendency to a retrograde movement, no circulation of water can take place.

The length of 4-inch pipe required to warm any building varies very much according to the character of the building. Thus, for each 1000 cubic feet of capacity, the lengths are approximately as follows:—

	Length of pipe.	Temperature maintained.
Churches and large public rooms, . . . . .	5 feet.	55° Fahr.
Dwelling-rooms, . . . . .	12 "	65° "
Work-rooms, . . . . .	6 "	50° to 55° "
Schools, . . . . .	6 to 7 "	55° to 58° "
Greenhouses and Conservatories, . . . . .	35 "	55° "
Graperies and Stove-houses, . . . . .	45 "	65° to 70° "
Hothouses, . . . . .	55 "	80° "

The best forms of boiler for heating purposes are shown in Figs. 5 and 6. The first is generally made

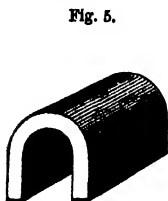


Fig. 5.



Fig. 6.

of wrought-iron plates riveted together; the second is of cast-iron.

In Perkins' system of warming by hot water, a continuous circulation of water is maintained through endless wrought-iron tubes of  $\frac{1}{4}$  inch bore and  $\frac{1}{4}$  inch thick, being 1 inch in diameter externally, and capable of supporting an internal pressure of 200 atmospheres or 3000 lbs. on the square inch. The temperature of the water at the upper part of the circuit varies from 300° to 400° Fahr., which correspond to pressures of from 60 lbs. to 220 lbs. per square inch. The tubes become red-hot in the furnace. 20 feet of length of pipe are allowed for heating 1000 cubic feet of capacity.

In large buildings fresh air cannot always be provided by what are commonly termed 'natural means', that is, by making use of the currents caused by the difference in weight of columns of air of different temperatures, and in such cases mechanical means are adopted, such as rotary ventilating fans, and these are often actuated by electric motors, which may form part of the structure of the fan itself. If the air is, however, laden with vapour, as is the case in public baths and laundries, it is advisable to avoid the latter arrangement, for the motor under such conditions is liable to rapid deterioration. In other cases cowls, such as the Boyle air-pump ventilator, are fixed upon the roof, and give satisfactory results.

Modern hospitals are probably the buildings most carefully designed to attain the best results both in warming and ventilation. In the large hospital recently built for the city of Birmingham, the windows are all kept closed, and the entire heating and ventilation are effected by means of air drawn from the outside by rotary fans, then washed, cleaned, and heated, and discharged at ceiling level into the wards and rooms, in which the atmosphere is thus kept at a pressure slightly exceeding that existing outside. The tendency, therefore, is for the flow of outgoing air to pass not only through the flues specially constructed for the purpose, but also through all cracks and pores in the structure. This system has, however, not been very widely adopted, and in the metropolis it is usual to provide open fires, with windows made to act as inlet ventilators, and to supplement this by hot-water radiators, or heating pipes placed, usually, below the window-sills, and provided with fresh-air inlets cut through the external walls.

The use of illuminating gas for heating purposes has largely increased during recent years, and when adopted the gas may be consumed in two different ways: either burnt with a luminous flame, or, when mixed with air, it may be consumed with a feebly luminous or heating flame. As an example of an apparatus designed to be used in the former manner we may cite Clark's 'Syphon' hygienic condensing gas stove, which consists of two Argand burners, with the usual chimney tubes and a drip tray. The carbonic acid gas produced usually passes into the air of the room, as the apparatus is seldom provided with a special outlet flue. The simplest method of employing gas with an atmospheric flame would at first sight appear to be the provision of a special casting with a number of jets in the bottom of an ordinary coal grate, and the addition of asbestos balls to fill the grate. This is, however, the most uneconomical method of using the gas, as a coal grate is not designed to give good results with gas. A more economical method is to fix a specially-designed gas stove in front of an ordinary fireplace, and to carry the flue into the chimney. A recent invention known as the Clamond stove has met already with some success. In this stove the atmospheric flame is inclosed in a perforated tube of fire-clay, which becomes incandescent, and the radiant heat more nearly resembles that given off by an ordinary coal fire than that given off by most other forms of gas stove. On the other hand, a novelty known as the Gasteam Radiator has also proved successful. This apparatus consists of a vertical radiator of the usual American form—a series of connected pipes forming a number of closely adjacent loops,—and at the base is arranged a row of atmospheric gas jets. A small quantity of water is contained in the radiator, which is rapidly converted into steam by the heat, and a regulating device is arranged in such a way that as soon as the pressure of the steam has reached 2 lbs. per sq. in., the gas supply is partially closed,

and equilibrium is thereafter preserved between the heat supplied and the heat dissipated. A small quantity of vapour is also discharged into the air, which prevents the dry feeling so noticeable with other apparatus.

For temporary purposes, where portability is very desirable, one of the modern forms of oil stoves is very useful. As yet oil has only been satisfactorily burnt with a luminous flame, but atmospheric oil-burners for heating have already been used in a tentative and experimental manner, and will probably prove valuable very soon.

Electricity has been used to some extent for heating purposes, and the apparatus are designed upon two distinct principles: either for the production of heat waves of low temperature suitable for heating the surrounding air, or for the production of radiant heat calculated to heat the surrounding walls and solid objects. Examples of the former type may be cited in the case of electric radiators, consisting of wires of high resistance embedded in some good insulating material, such as enamel; and an example of the second is the apparatus consisting of several large incandescent lamps fixed before a polished reflector. Both varieties give satisfactory results, the latter being of the more pleasing appearance; both, however, are expensive methods of heating, although commendable as causing no vitiation of the air.

**WARMINSTER**, a market-town of England, in Wiltshire, at the western end of Salisbury Plain, 15 miles S.W. of Bath. It is an ancient place, with a twelfth-century church, rebuilt in 1887-89, other places of worship, a town-hall, an old grammar-school, a savings-bank, an atheneum, missionary colleges for men and women, a reformatory, a cottage hospital, almshouses, &c. It has works for silk-winding, engineering, and the manufacture of agricultural implements and machinery, breweries and maltings, &c. Roman and other ancient remains have been found in the vicinity. Pop. in 1891, 5563; in 1901, 5647.

**WAR OFFICE**, the department of the executive government through which the Secretary of State for War administers the military system of the United Kingdom. He is at the head of the whole army administration, both civil and military, and is a cabinet minister responsible to parliament. He has as his chief adviser the commander-in-chief, and there are now also a War Office Council, a Permanent Executive Committee of the War Office, and special departmental committees. See **ARMY**, **BRITAIN**.

**WARPING**, a mode of fertilizing poor or barren land by means of artificial inundation, the admitted waters being such as can deposit silt or earthy matter on the land.

**WARRANT**, an instrument authorizing some one to do what he would otherwise have not the right to do. In commercial and business relations the principal kinds of warrants are dividend-warrants and dock-warrants, but the term is best known in connection with legal procedure. A distress-warrant is an authorization to a proper officer to distrain upon a person's goods, and a search-warrant authorizes the search within specified premises for stolen goods, goods illegally stored, &c. Numerous other types of warrant are known by distinguishing names, but some instruments of this kind are called writs, executions, &c. General warrants, that is, warrants in which no particular person is named, but all suspected are ordered to be arrested, are illegal in the United Kingdom.

**WARRINGTON**, a county, municipal, and parliamentary borough of England, in Lancashire, on

the river Mersey and the Manchester Ship Canal, near the Sankey and Bridgewater Canals, 15 miles east of Liverpool. Its buildings and institutions include: the parish church of St. Elphin (restored), in Decorated style; other modern parish churches; Nonconformist and Roman Catholic churches; the town-hall, in classical style; the museum, containing a free library and municipal art-gallery; the grammar-school, blue-coat school, clergy orphan daughters' school, St. Elphin's schools, a training-college for school-mistresses, a municipal school of art, technical schools, and other educational institutions; post-office; public baths; new police premises; the market-hall; municipal gas-works, water-works, tramways, electric-light works, and works for the treatment of night-soil; an infectious diseases and a smallpox hospital, and an infirmary; a gymnasium; a public cemetery; public parks and gardens; and military barracks. Of the numerous industries of the town the most important are the manufacture of iron and iron goods, wire, leather, soap, and beer. Warrington is an ancient town, and had at one time a house of Augustinian friars. The famous academy, which existed here from 1757 till 1783, had among its teachers Dr. Joseph Priestley, Dr. William Enfield, Dr. Aikin, Dr. John Taylor, the Rev. Gilbert Wakefield, and other eminent men; it is now represented by Manchester College, Oxford. Pop. of county borough (1891), 52,743; (1901), 64,241.

**WARRNAMBOOL**, a seaport and municipal town of Australia, in the colony of Victoria, in Villiers county, on Warrnambool or Lady Bay, 166 miles south-west of Melbourne. The principal public buildings are the Episcopal, Roman Catholic, and other churches, various banking and insurance offices, mechanics' institute, the Oddfellows' and the volunteer artillery halls, a hospital, and benevolent asylum, &c. Steamers ply regularly several times a week to Melbourne, and a good trade is done from the port in wool and other agricultural produce. To facilitate the loading and discharging of vessels a viaduct and breakwater pier has been constructed. The town contains a flour-mill, biscuit-factories, boot-factories, tanneries, breweries, &c. Pop. (1901), 6410.

**WARSAW**, the capital city of Russian Poland, partly on a flat, and partly on a height rising gradually from the left bank of the Vistula, here crossed by an iron bridge 1660 feet long, and by a railway bridge, communicating with the suburb of Praga, 325 miles east of Berlin. It consists of the city proper and several suburbs, inclosed for the most part along with it by a rampart and fosse, and defended or overawed by a vast citadel erected by the Russians. In the older parts the streets are narrow, and the houses, generally of very indifferent appearance, are huddled together without any order; in the newer part, and more especially in some of the suburbs, the streets are often spacious, and many ranges of handsome buildings are seen; but the impression produced is by no means favourable, and Warsaw, as a whole, is decidedly ill-built, badly-paved, and dirty. It has, however, several large public squares, among which that of Sigismund, adorned with a bronze colossal statue of the third king of that name, is particularly deserving of notice; and the vicinity is well provided with beautiful promenades. The more remarkable public buildings are the Roman Catholic cathedral, the Russian cathedral, the church of the Holy Cross, the church of the Carmelites, the Lutheran church, the Zamek or ancient castle of the Polish kings, a huge pile on a height overhanging the Vistula; the palace of Casimir, occupied by the university and adorned in front with a statue of Copernicus; the Saxon



palace, with fine gardens attached to it; the Krasinsky palace, occupied partly by the superior courts of law and partly by government offices; several other palaces similarly occupied; the town-house, arsenal, mint, custom-house, exchange, barracks, several theatres, and the bazaar of Mariaville, consisting of a large square lined with arcades. The principal educational establishments are the university, suppressed after the rebellion of 1830, reopened in 1864; a lyceum, technical, commercial, and many other schools. Among the benevolent institutions are a town and a military hospital, a foundling hospital, a deaf and dumb and two lunatic asylums. The manufactures consist of metals, beer, tobacco, textiles, chemical products, furniture, artificial flowers, musical instruments, &c. The trade is very extensive, Warsaw being by far the most important commercial emporium of Poland, and carrying on a large traffic both with the interior and with Thorn and Danzig, by means of the Vistula. Warsaw, though very ancient, did not become the capital of Poland till about the middle of the sixteenth century. Pop. in 1897, 688,208, of whom above a fourth are Jews.

**WART** (*verruca*), a thickening or induration of the cuticle. These little tumours form most commonly on the face and hands, and either drop off spontaneously or may be removed by the application of nitrate of silver, tincture of iron, glacial acetic acid, or by tying or cutting them off.

**WARTBURG**, an ancient mountain castle of Germany, not far from Eisenach, belonging to the Grand-duke of Saxe-Weimar. It was built between 1069 and 1072, and was the residence of the land-graves of Thuringia. The elector Frederick the Wise of Saxony caused Luther, who had been outlawed by the Diet of Worms, to be carried thither, where he lived from May 4, 1521, to March 6, 1522, engaged in the translation of the Bible. The room in which he laboured is yet seen.

**WART-HOG** (*Phacochoerus*), a genus of Ungulata, so named from the presence of a peculiar warty protuberance on each cheek, and belonging to the family of the Suidæ or Swine. The *P. Eliani* of Northern Africa is a familiar species, sometimes known under the names of *Halluf* or *Harcja*. Another species is the Vlakke Vark (*P. Athiopicus*) of South Africa, which, like the preceding form, has tusk-like canines and a large wart under each eye. The molar teeth number ten or twelve in each jaw, according to the age. The animal attains a length of 3 or 4 feet, and is of a black colour on the back. The tusks may be 8 or 9 inches long. It is a fierce and courageous animal, and fights desperately when pursued. See Plate I., fig. 13, at UNGULATA.

**WARTON**, THOMAS, a poet, critic, and literary historian, was the son of the Rev. Thomas Warton, professor of poetry at Oxford, and was born at Basingstoke on Jan. 9, 1728. He graduated from Trinity College, Oxford, in 1747, and took orders, and in his twenty-first year distinguished himself by his *Triumph of Isis*, a poetical vindication of his *alma mater* against the reflections in Mason's *Elegy of INIA*. In 1750 he took the degree of M.A., and next year he was chosen a fellow of his college. His *Observations on Spenser's Faerie Queene*, published in 1754, made him favourably known as a critic, and prepared the way for his election in 1757 to the professorship of poetry at Oxford, which he filled for ten years with great ability. He was instituted to the living of Kiddington, in Oxfordshire, in 1771. The first volume of his *History of English Poetry* was published in 1774, and the second and third respectively in 1778 and 1781. His plan was extensive, including the period from

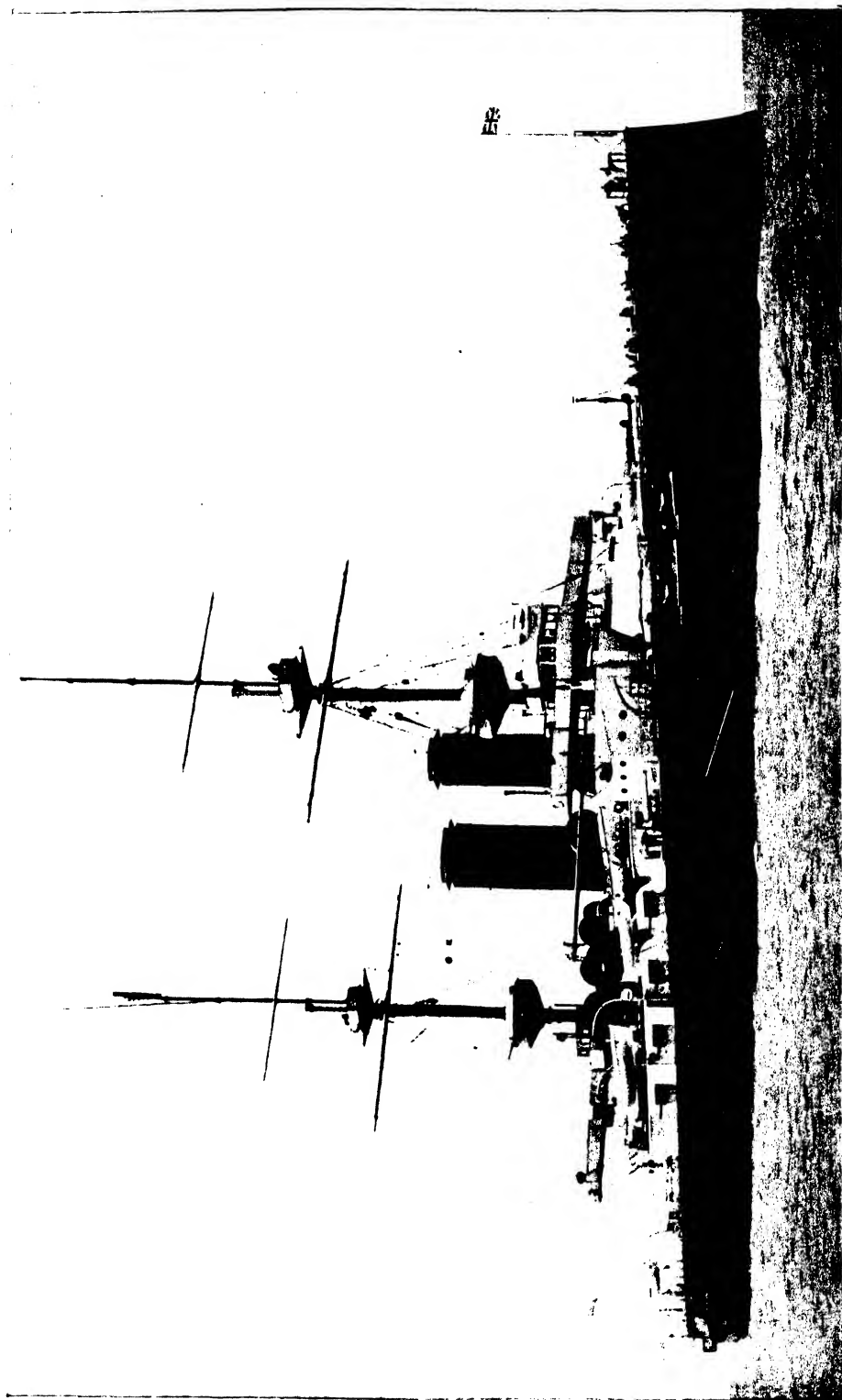
the eleventh to the eighteenth century; but the history reaches no farther than the reign of Elizabeth, and a few sheets only of a fourth volume were prepared for the press when he relinquished his undertaking. The work is a mine of information, and is invaluable to the literary student. A new edition, with the notes of Ritson, &c., was published in 1824; an improved edition, edited by Richard Taylor, was published in 1840; and another, with considerable alterations, under the editorship of W. C. Hazlitt, in 1874. In 1785 Warton became Camden professor of history at Oxford, and succeeded Whitehead in the office of poet-laureate. His last publication was an edition of the smaller poems of Milton, with instructive notes. He died suddenly from a paralytic attack at Oxford, May 21, 1790. He published a collection of his poems in 1777; and his *Poetical Works*, with *Life*, by Richard Mant, appeared in 1802.—His brother, JOSEPH (born 1722; died 1800), also a distinguished literary critic, deserves mention as the author of an *Essay on the Writings and Genius of Pope* (vol. i. 1757; vol. ii. 1782); of a volume of *Odes*; as the editor of an annotated edition of Pope's works (nine vols. 8vo, 1797); of the works of Virgil—the *Georgics* is his own translation—(four vols. 8vo, 1758); and an uncompleted edition of Dryden.

**WAR-VESSELS**. Some account of the oar-propelled fighting-ships of antiquity is given in the article **GALLEY**, and further information concerning them and more recent war-vessels will be found in the article on **NAVIES AND NAVIGATION**. The war-vessels of the present day differ radically from those of even the earlier part of last century. At that time they were constructed of wood, but now they are built of steel. They were then propelled by means of sails, but to-day the motive power is steam, and the immediate means of propulsion the screw-propeller. Steam, hydraulic, or other power, moreover, is now used in ships of war for many operations, other than propulsion, which were formerly done by hand. The electric light has been introduced, the system of signalling by flags, lights, and semaphore has been perfected, and now the larger war-vessels are fitted with a Marconi wireless telegraphy apparatus. The guns carried by the modern iron-clad are immensely superior in speed of working, in the velocity of propulsion, in range, and in penetrative power to those of the old wooden-walled three-decker; and the change in their nature has necessitated a different method of mounting and a consequent complete transformation in the appearance of the vessel. The torpedo has been invented, and means of protection against it, as well as against the improved modern guns, have been introduced.

The *Great Harry*, built in the reign of Henry VII., was the first British war-vessel in anything like a modern sense. Under Henry VIII. was built the *Henry Grace de Dieu*, a three-decked vessel carrying seventy-two guns. The poops and forecastles of these and all other vessels of the navy at that time were of very great size. Great improvements were effected by Phineas Pett in the reigns of James I. and Charles I., especially in the removal of the purely ornamental and clumsy top-works. His chief productions were the *Prince Royal* (1610), regarded by Stowe as 'the greatest and goodliest ship that was ever built in England', and the *Sovereign of the Seas* (1637), a vessel which did good service against the Dutch, and was accidentally destroyed by fire in 1696. For a long time afterwards naval architecture was more advanced in France than in Britain, and many vessels in the British navy were either captured from the French or copied from French models.

Steam was introduced into the royal navy only





H.M.S. *London*, First Class Battle-ship.



after it had begun to establish itself in merchant vessels. The *Penelope*, a 46-gun frigate, was the first important war-vessel propelled by paddles. The *Rattler*, launched in 1843, was the first Admiralty vessel fitted with a screw; and the *Agamemnon*, a 50-gun ship launched in 1852, was the first designed for the screw-propeller from the outset. The fifties of last century saw the construction of the earliest floating-batteries protected by iron plating, at first in France, where the earliest was the *Tonnante* (1855), but immediately afterwards in England, where the pioneer vessels of this kind were the *Erebus*, *Terror*, *Thunderbolt*, and some others. *La Gloire*, launched at Toulon in 1859, was a sea-going, wooden, armour-plated frigate, and was replied to by the British Admiralty with their first sea-going iron-clad ship, the *Warrior*, which was launched near the end of 1860. Her length was fully 380 feet, her displacement 9200 tons, her indicated horse-power 5470, and her speed 14·3 knots. The thickness of her armour, as in the case of *La Gloire*, was 4·5 inches, but she was unprotected at each end. A sister ship named the *Black Prince* soon followed, and in other ships built soon afterwards the armour was extended from end to end. The introduction of the ram, a revival of a feature in ancient ships of war, took place about the same period, and in this also the French were the pioneers. The torpedo came into use soon after the middle of last century, but it was not till the seventies that the Whitehead fish torpedo, now in use, was devised and adopted. Special vessels, called torpedo-boats, have been built in large numbers to discharge torpedoes, but all ships of war of any size are provided with torpedo tubes. Torpedo-boat destroyers are a more recently introduced class of vessels intended to attack and destroy the torpedo-boats. The success of Ericsson's *Monitor* in the American Civil War brought into prominence the turret system of construction, and for a time there was much discussion as to the relative superiority of this and the broadside system. Turret ships have on deck revolving turrets, each carrying one or more large guns. The first British turret ship was the *Royal Sovereign* of 1862, but the first sea-going turret vessel was the *Monarch* of 1865. The *Devastation* and *Thunderer*, which followed a few years later, were turret ships without masts, and marked another step in advance. The *Collingwood*, completed in 1886, was the first of the modern barbette ships, that is, those carrying guns exposed on the upper deck, but inclosed in pairs by a fixed armoured base or barbette affording protection to the mechanism for working the guns. Iron has now been displaced by steel in naval construction, and in quite recent years great improvements in guns have been effected, notably in the introduction of quick-firing and machine guns, and in the quality of powder used. One of the latest developments in naval architecture for war purposes is the introduction of submarine boats. Some particulars regarding them will be given later in the article.

Warships may be classified generally thus: (1) Ships for offensive and defensive purposes, which must be prepared to fight at any time during war; these are called battle-ships, and in them armour and armament are of primary importance, and speed is secondary. (2) Ships that may fight if they desire or are compelled to; this class includes cruisers and torpedo craft; with them high speed is essential, and the armour and armament is of a much lighter nature than in a battle-ship.

Battle-ships are of the first, second, or third class, according to their value as fighting-ships, which is gauged by the extent and resisting power of their armour, the number, range, and penetrating power

of their guns, their maximum speed and radius of action; it generally follows that the size of ship is greatest in the first-class, and least in the third-class. Only battle-ships of the first class are built by Great Britain, and these remain in the first class until they are so far surpassed by new vessels that they are out-classed, when they become second-class battle-ships; after a further lapse of time, if they survive, they become of the third-class. The *London* may be taken as typical of a first-class British battle-ship. Of 15,000 tons displacement, she is 400 ft. in length by 75 ft. beam, and has a mean draught of water of 28 ft. 9 in. when ready for sea. She has twin-screw engines, developing 15,000 indicated horse-power, and giving her a speed of 18 knots per hour; her side armour is 9 in. thick, and the armour bulkhead is 12 in., all of Krupp steel; she carries four 12-in. and twelve 6-in. guns, besides twenty-four small quick-firing ones and two torpedo tubes; she was built at a cost of slightly over one million pounds sterling, and has a complement of 750 men. In the *Duncan* class, by the introduction of Krupp steel of 7 in. thick for the side armour and 14 in. thick for the bulkhead armour, the large guns remaining the same as in the *London*, sufficient weight has been saved to allow of the displacement being reduced to 14,000 tons, and the fitting of engines to develop the 18,000 I.H.P. necessary to propel her at a speed of 19 knots per hour. Later ships of the *London* class have eight 7·5-in. guns and ten 6-in. ones, instead of four 12-in. and twelve 6-in. ones. The 12-in. guns carried by these vessels weigh 50 tons each, and throw projectiles weighing 850 lbs., which can pierce wrought-iron 28·7 in., or Krupp steel 11·5 inches in thickness, at 3000 yards distance. The 7·5-in. guns are 'quick-firing', and weigh each 14 tons; they can throw projectiles of 200 lbs. weight, and pierce 16·2 in. of wrought-iron, or 7-in. Krupp steel, at 3000 yards. The *London* cost £1,028,000.

Cruisers of the first, second, and third-class are built by Great Britain, although the process of degradation from class to class also goes on with them as with battle-ships. Although some of the larger cruisers could take their place in line of battle, their function in war time is to protect the merchant shipping of the country and to capture that of an enemy. Cruisers would also be employed in scouting and reconnoitring in time of war; this could be done by the second and third-class vessels where fast enough.

Among recent first-class cruisers built by Britain are those of the 'County' class (being named after counties), about 440 ft. long by 68 ft. broad, with a mean draught of water of 24 ft. 6 in., and a displacement of 9800 tons; they have 22,000 I.H.P., and can attain a speed of 23 knots with this power; their armour on the broadside is 4 in. thick, decreasing to 2 in. thick at the fore end, and the bulkhead armour is 5 in. thick, all Krupp steel; the armament consists of fourteen 6-in. guns, thirteen small quick-firing guns, and two torpedo tubes. These vessels cost about £700,000 each, and have a complement of 500 men. Their 6-in. guns weigh 7 tons each, and throw a projectile of 100 lbs. weight, which, at 3000 yards, can pierce 7 inches of wrought-iron, or 3·2-in. Krupp steel.

The second-class cruisers are unarmoured, having only a sloping deck in way of the water-line, which is intended to protect the vitals of the ship, such as engines, boilers, and magazines, from the effects of shell explosion within the ship, and possibly by causing shots which strike it to glance off. This deck is water-tight, and prevents water from getting below if the side is pierced in the vicinity of the water-line; it is known as a 'protective' deck, and

is sloped down to meet the shell of the ship at about 8 feet below the water-line, so that when the vessel rolls, or the side below water is exposed, an enemy may not send a shot under the deck. Protective decks are formed by two or three thicknesses of steel plating riveted together, and are in this class 3 in. thick on the slope and 1½ in. thick on the flat. Unarmoured cruisers offer practically no resistance to shot and shell passing through their upper works, except round the large guns, where casemates 3 in. thick on the front are formed. Second-class cruisers of the *Hermes* type have a displacement of 5600 tons on 20 ft. 6 in. mean draught; their length is 350 ft., and breadth 54 ft., and with 10,000 I.H.P. they attain a speed of 20 knots; their armament consists of eleven 6-in. and fifteen smaller quick-firing guns, and two torpedo tubes in the broadside. These vessels each cost about £280,000 to construct, and they carry 477 men. A typical third-class cruiser is the *Pandora*, whose displacement is 2200 tons on 13 ft. 6 in. draught; her length is 305 ft., and breadth 36 ft. 9 in., and with 7000 I.H.P. she attains a speed of 20 knots; she carries eight 4-in. and eight 3-pounder quick-firing guns, besides two torpedo tubes. This class costs about £160,000 per ship, and each vessel carries 224 men. Battle-ships and cruisers are constructed with ram-bows formed of cast-steel in the case of unsheathed ships, and of phosphor bronze in sheathed vessels; these are for the purpose of sinking an enemy's ship by piercing it below the water-line.

Gun-boats are vessels built more for police duties than for warlike purposes, and vary in type according as they are required to follow the fishing-boats in the North Sea, or to patrol some African river, or to do some other special service. Their displacement seldom exceeds 800 tons, and their speed 13 knots; their largest guns are 4 in., of which the *Thrush* carries six, and the *Dwarf* two. All cruisers and gun-boats intended for foreign stations where dry-docks do not exist are sheathed with teak about 3½ in. thick on the outside of the steel shell-plating; outside of this again is nailed sheet-copper. This copper prevents the adhesion of marine growths to the vessel's bottom by exfoliation.

Torpedo-boats are vessels whose chief function is to sink the vessels of an enemy by discharging torpedoes at them, consequently their armament consists chiefly of torpedo tubes. The later vessels of this type carry three tubes, and have also three 3-pounder guns. These vessels are about 140 feet in length, steam about 23 knots, and carry 18 men. Second-class torpedo-boats are only 60 ft. long, and carry two torpedo tubes and a machine gun. They are worked by 7 men, and steam 16 knots. They are generally carried on a battle-ship.

In 1893 another class was added to the British navy, viz. torpedo-boat destroyers, vessels of high speed, built to run down and sink the torpedo-boats of an enemy by means of quick-firing guns, which they carry. The earlier boats had a speed of 27 knots, and those built since 1896 have attained a speed of 30 knots. These later vessels vary in length from 210 to 227½ ft., and displace about 450 tons when fully laden. They carry one 12-pounder, five 6-pounder Q.F. guns, and two torpedo tubes, so that not only can they destroy the torpedo-boats of an enemy by means of their guns, but at the same time they can perform the duties of a torpedo-boat proper. The torpedo tubes of torpedo-boats and of destroyers are carried on deck, and are not submerged like those fitted to the latest cruisers and battle-ships.

A new kind of vessel, the 'submarine', was added to the British navy in 1901. Five submarine boats similar to those designed for the United States

government were ordered by the Admiralty for experimental purposes. They are 63 ft. 4 in. long and 11 ft. 9 in. in beam, and their displacement when submerged is 120 tons. In shape they are described as double-pointed spindles with a conning-tower on the back, and vertical and horizontal rudders. They are built of steel sufficiently strong to withstand water pressure at depths not exceeding 100 feet. Like other warships they are provided with bulkheads. At the surface they are propelled by gasoline marine engines specially adapted, and they can attain a speed of 8 knots per hour. When submerged they are driven by 'waterproof' electric motors at a speed of 7 knots per hour. The motors are worked by accumulators sufficient for a four hours' journey beneath the surface. Incandescent electric lamps supply light when the vessel is submerged. The supply of air to the crew is provided for by the storage of compressed air. Steering and diving can be effected either by means of hand-gear or by special engines. The armament consists of a torpedo tube at the bow. It is still a matter of uncertainty how far the submarine may affect the conditions of naval warfare, but the prevailing opinion, at least in Britain, appears to be that the new type of vessel will prove comparatively ineffective. Longitudinal stability is difficult to maintain; diving in rough water is dangerous, and under any circumstances it is as yet too slowly effected; and so far no completely satisfactory means of gauging direction and position when submerged has yet been introduced. In small vessels containing much steel and electrical apparatus the compass cannot be relied upon, and even the gyroscope, which has been used as a substitute, is unsatisfactory. The French, who were the pioneers in submarine navigation, use an instrument called the *periscope* for obtaining a view of the surface, but it is very imperfect, and has been even described as valueless. An invention allied to that of the submarine warship is the *actinaut*, or torpedo steered by means of electrical influence conveyed without wires. Submarine navigation dates back for some time, but in its present form it does not go back much earlier than the last decade of the nineteenth century.

Warships are all built of steel, some being afterwards sheathed with wood, as already explained. Steel with a tensile strength of 32 tons per square inch has been used in some parts of the structure of the latest vessels, while nickel steel has been used almost throughout in some torpedo-boat destroyers. Nickel steel has an ultimate tensile strength of about 37 tons per square inch, which is 30 per cent greater than that of mild steel, and for the same strength of structure a consequent reduction is made in weight of the hulls of vessels built throughout of nickel steel, as compared with vessels built of mild steel, of 26 to 30 tons per square inch tensile strength.

The desire of the warship designer is to minimize weight wherever it can possibly be done, while retaining the necessary strength, so that on a given displacement he may give more weight to the machinery, and thereby secure higher power and greater speed, or to allocate the weight saved to additional armament or armour. Any saving of weight in the structure as a whole may be used to make the warship a more efficient fighting machine. Almost all war-vessels have side bunkers for carrying coal. When these are filled, the coal forms a protection from the enemy's shot and shell. This it does in two ways: firstly, by stopping the progress of the projectile, and in the case of a shell, causing it to explode amongst the coal, where its effect would be comparatively harmless; and secondly, by occupying the greater part of the space





which the water would otherwise rush into when the outer plating is pierced. It is therefore desirable that a vessel, on going into action, should have her coal-bunkers full; but as the warship designer cannot rely on the ship going into action with bunkers full, other means are taken to minimize the effect of shots or shell piercing the skin of the ship. The vessel is divided up into a large number of water-tight compartments, with the intention that, if one compartment is damaged, the water which flows in may be confined to this one compartment. This principle is adopted in all large vessels nowadays, warships or merchantmen, in fitting a cellular double bottom, an arrangement whereby the space between the outer and inner bottoms of the ship is divided into cells by transverse water-tight floors and longitudinal girders extending from the outer to the inner bottom.

At the water-tight compartments in way of the ship's water-line an additional precaution is taken in warships. In some places where it is probable that a shot or shell may pierce not only the ship's side but also one of these fore-and-aft water-tight bulkheads forming the subdivision, a cofferdam is fitted on that bulkhead on the side farthest from the sea. A coffer-dam is formed by a partial bulkhead carried to about 3 feet above the load water-line, parallel to and about 1 foot from the bulkhead it protects. Before a vessel goes into action it is intended that these coffer-dams should be filled with canvas bags, sails, oakum, or cellulose, and should the bulkhead be pierced by projectiles the aperture can be blocked up by ramming down the canvas or sails, or if cellulose be used, the water reaching it will cause it to swell up and automatically fill the hole. Torpedo-boat destroyers and gun-boats carry neither armour nor a protective deck, and rely entirely on subdivision, while cruisers and battle-ships use subdivisions as supplementary to their protective decks and armour.

Plate I. represents H.M. battle-ship *London*. On the bridges and at the mainmast-head are semaphore arms for signalling, and in the lower fighting tops are quick-firing guns. Search-lights are fitted in the upper tops and on both bridges. At the mainmast-head a yard is fitted for using the Marconi system of wireless telegraphy. Round her side are arranged torpedo netting and booms in their stowed positions. During war-time, when this ship may be at anchor or moving slowly, and liable to a torpedo attack, these booms would be stayed square to the ship's side, the steel-wire netting unrolled and hung from the extremities of the booms, so forming a shield along the sides of the ship. If a torpedo strikes this netting it would probably be exploded there, and do little or no harm to the ship.

Immediately underneath the forward bridge is the conning-tower, the sighting slot of which is visible in the plate. This is an armoured round-house from which the ship is conned in action, and it is fitted to almost all war-ships. It is more completely seen in figs. 1 and 2, Plate II.

Inside it are means of communication with all gun positions, torpedo positions, engine-room, &c., and a steering apparatus. To ensure that this communication be maintained in action the leads are taken from the conning-tower downwards in an armoured tube, and lead to the various stations under the water-line or armoured deck.

A boom is shown fitted on the foremast; this is for hoisting out the heavier boats, which are stowed nearer the centre-line of the ship than the smaller ones, these latter being hoisted in and out by davits. Electric boat-hoisting engines are fitted on the latest war-ships.

Plate II., fig. 1, represents H.M.S. *Oressy*, first-class cruiser. The fittings, other than the guns, are very like those of the *London* just described. The battle-ships of the British navy have all much less freeboard than the large cruiser type, and they therefore present a much smaller target to an enemy's guns. In the older battle-ships this reduction of freeboard was carried to such an extent as to cause the forward deck to be always awash when steaming, even in moderate weather.

Fig. 2 of same plate represents H.M.S. *Hyacinth*, second-class cruiser and sister ship to the *Hermes* already described.

Fig. 3, Plate II., shows a 30-knot torpedo destroyer at full speed. Almost all these vessels have a turtle-

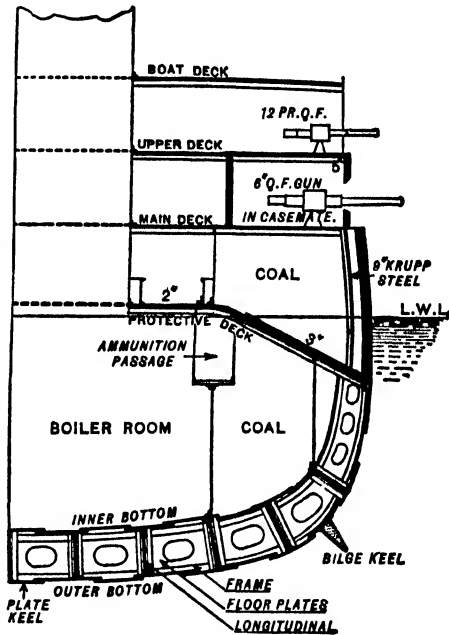


Fig. 1.

back forecastle to throw off water when they are steaming against head seas.

Plate II., fig. 4, shows the first British submarine warship being launched from the yard of Messrs. Vickers, Sons, & Maxim, Limited, Barrow-in-Furness.

Fig. 1 here given represents diagrammatically the midship section of a battle-ship. Longitudinal strength is given by the shell plating, plating behind armour, longitudinals, and the decks, while transverse strength is given by the frames and floor-plates, beams and decks, and the shell plating.

Fig. 2 shows a broadside view of the stem of a battle-ship or armoured cruiser. This is cast in two parts, the junction being at the platform deck. Rabbits are made in the casting to receive the armour or shell plating as shown in the sections, and landing-pieces are formed to receive the decks.

The ram is reinforced by a cast-piece extending aft for a considerable length and from side to side of the ship, where it is connected to the shell.

The protective deck is also carried down to strengthen a part of the stem likely to be strained in ramming.

Some particulars of the principal vessels of the British navy may be added here. The *Collingwood*,



mentioned above, was the earliest of the Admiral class of battle-ships, which includes also the *Rodney*, *Benbow*, *Camperdown*, *Howe*, and *Anson*. These vessels are of little value for modern warfare, and are now rated third-class. The *Trafalgar* and *Nile* (completed 1890), sister ships of 11,940 tons displacement, are more heavily armoured and still of value, being rated second-class. The *Royal Sovereign*, completed in 1892, was the first of a new group, now rated second-class, and including also *Empress of India*, *Repulse*, *Royal Oak*, *Ramillies*, *Resolution*, and *Revenge*. Their displacement is 14,150 tons, the extreme armouring 18 inches, their I.H.P. 13,000, and their speed 17·5 knots. The *Hood* (completed 1893) is practically identical. The *Centurion* and *Barfleur* (1894) are smaller but slightly faster vessels

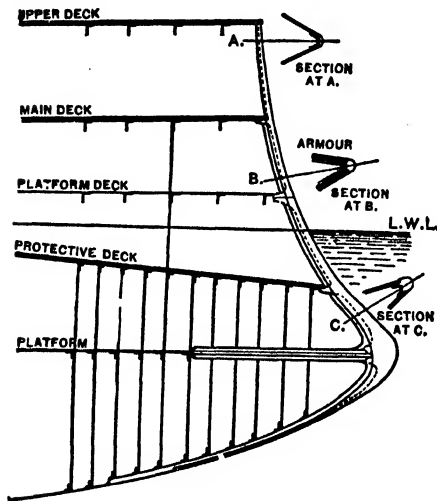


Fig. 2.

of the same type, and the *Renown* (1896) is an intermediate vessel with thinner armouring and an inclined armour-deck. The *Majestic* (1895) gives name to a class of first-class battle-ships, including also the *Magnificent*, *Prince George*, *Victorious*, *Jupiter*, *Cæsar*, *Hannibal*, *Illustrious*, and *Mars*, all completed by 1897. They displace 14,900 tons, and have an extreme armouring of 14 inches. They have a lower I.H.P. (12,000) and fewer torpedo tubes (5) than the *Royal Sovereign* class, but their speed is the same. The *Canopus* (1900) was the first battle-ship to be provided with a Belleville boiler, and it gives name to a class supposed to be slightly superior to the preceding, and including *Ocean*, *Goliath*, *Albion*, *Glory*, and *Vengeance*, all completed by 1902. Their displacement is 12,950 tons, their extreme armouring 12 inches, their I.H.P. 13,500, and their nominal speed 18·75 knots. The *Formidable*, *Irresistible*, and *Implacable* (1902) are similar vessels of greater displacement (14,700 tons) and greater I.H.P. (15,000), but of slightly less nominal speed. The *London*, *Venerable*, and *Bulwark* (1902) are practically identical with the *Formidable* class, but they have much increased bow armour. The *London* is illustrated in the plate, and described above. Six vessels of the *Duncan* class (*Duncan*, *Cornwallis*, *Russell*, *Exmouth*, *Montagu*, and *Albemarle*) are of 14,000 tons displacement and rather thinner armouring than the *Formidables* and *Londons*, but they have greater I.H.P. (18,000) and develop greater nominal speed (19 knots). The *Queen* and *Prince of Wales* are

sister battle-ships of 15,000 tons of the same general type and speed, but with a somewhat different armament. The *King Edward*, *Dominion*, and *Commonwealth* mark a new departure in some ways. Their displacement reaches the large amount of 16,500 tons, but their I.H.P. and nominal speed are the same as in the *Duncan* and *Queen*. Armoured casemates are done away with, and a complete armoured battery substituted on the main deck, and four 9·2-in. guns are mounted in secondary turrets. Their armament consists of four 12-in. guns, four 9·2-in. Q.F. guns, ten 6-in., and twenty-eight 3-in. Q.F. guns, being thus considerably different from that of the *London*. Among the older cruisers are two, the *Impérieuse* (1886) and *Warspite* (1888), of 8400 tons, belted, 10,000 I.H.P., and 16·7 knots nominal speed; seven of the *Undaunted* type, belted, of 5600 tons, 8500 I.H.P., and 18·5 knots speed; the *Blake* (1889) and *Blenheim* (1890), of 9000 tons displacement, 20,000 I.H.P., and 22 knots nominal speed; five of the *Edgar* (1890) class, deck-protected cruisers, of 7350 tons displacement, 12,000 I.H.P., and 19·7 knots nominal speed; and four of the *Crescent* (1892) type, similar to the preceding, of 7700 tons, 12,000 I.H.P. In 1894-96 nine protected cruisers of the *Eclipse* class were built, of 5600 tons displacement, 9600 I.H.P., and 19·5 knots nominal speed. The *Powerful* and *Terrible*, two huge deck-protected cruisers of 14,200 tons, completed in 1895, have no side protection, and a comparatively weak armament, but a large coal supply. They develop an indicated horsepower of 25,000, and have a nominal speed of 22 knots. Four vessels of the *Furious* type were completed in 1896. These are deck-protected cruisers of 5750 tons displacement, 10,000 I.H.P., and 19 knots speed. The *Hermes*, *Hyacinth*, and *Highflyer* of 1898, two of which are mentioned above and one illustrated in the plate, carry eleven 6-in., and fifteen smaller Q.F. guns. The *Diadem* (1896) and its seven sisters, all built by 1898, are smaller *Powerfuls*. They displace 11,000 tons, develop an I.H.P. of 16,500, and a speed of 20·5 knots. Their armament consists of sixteen 6-in., fourteen 12-pounder, and twenty smaller Q.F. guns. The *Cressy* (1902), illustrated in the plate, is the type of a class of six armoured cruisers (*Hogue*, *Aboukir*, *Sultej*, *Euryalus*, *Bacchante*) of 12,000 tons displacement, 21,000 I.H.P., and 21 knots speed, and with armament very like that of the *Powerful*. More recent cruisers are those of the County class, including the *Essex*, *Kent*, *Monmouth*, *Bedford*, *Berwick*, *Cornwall*, *Cumberland*, *Donegal*, *Lancaster*, and *Suffolk*, all of 9800 tons, 22,000 I.H.P., 22 knots speed, and armoured like the *Cressy*; the *Drake*, *King Alfred*, *Leviathan*, and *Good Hope*, armoured, of 14,100 tons, 30,000 I.H.P., and 23 knots speed; and the *Encounter* and *Challenger*, protected, of 5600 tons, 9600 I.H.P., and 19·5 knots.

WARWICK, a central county of England, bounded on the north by Stafford, Derby, and Leicester; on the east by Northampton; on the south by Oxford and Gloucester; on the west by Worcester; area, 577,462 acres. The surface is finely diversified by gentle hills and vales, and is well watered, chiefly by the Avon and the Tame. The climate is mild and salubrious, and the soil, with the exception of some cold, stiff clays on the higher grounds, is fertile, consisting mainly of a strong red or of a sandy loam—the one well adapted for wheat or beans and the other for barley and turnips. Much land is kept in permanent pasture for grazing, and fine timber is abundant. About a fifth of the total cultivated area is under corn crops, chiefly wheat and oats; about a twentieth under green crops, especially turnips,

potatoes, and mangold; and more than 300,000 acres are in permanent pasture. The cultivated area is about six-sevenths of the total area. Sheep and cattle are numerous. The most valuable minerals are coal, limestone, sandstone, blue flagstone, and fire-clay. Manufactures of the most varied and diverse kinds are carried on in the towns. The natural deficiency of river communication has been amply compensated by canals and railways, which traverse the county in all directions. The county sends four members to Parliament, the divisions being Nuneaton, Rugby, Stratford-on-Avon, and Tamworth. Aston Manor, Birmingham, Coventry, and Warwick and Leamington are parliamentary boroughs. The county town is Warwick; the other chief towns are Birmingham, Coventry, Leamington, Rugby, and Stratford-on-Avon. Pop. (1881), 737,339; (1891), 805,072; (1901), 897,678.

**WARWICK**, a mun. and parl. borough and market-town of England, capital of the above county, on the right bank of the Avon, 90 miles north-west from London, pleasantly situated on an eminence rising somewhat abruptly from the river. The principal buildings are the Church of St. Mary, with adjoining chapter-house, lady-chapel, and various interesting monuments, among them the tomb of Earl and Countess Warwick, who died in 1369; the Earl of Leicester's hospital for aged brethren, a very ancient structure; the shire-hall, jail, museum, endowed grammar-school, east and west gates, &c. The chief manufacture is gelatine; and the trade in cattle, corn, and provisions is considerable. The principal object of interest is the ancient and magnificent castle, the residence of the earls of Warwick. The date of the original erection is unknown. Caesar's Tower, the most ancient part of the structure, is 147 feet high; Guy's Tower, 128 feet high, was erected in 1394. The approach to the grand front exhibits three stupendous towers, and the entrance is flanked with embattled walls covered with ivy. It was partially destroyed by fire in 1871; but the most ancient portion remains uninjured. Warwick and Leamington form a parl. bor., sending one member to Parliament. Pop. (1881), 11,802; (1891), 11,903; (1901), 11,889.

**WARWICK, EARL OF.** See EDWARD IV.

**WASH, THE**, a large estuary on the east coast of England, about 22 miles long by 15 wide, between the counties of Norfolk and Lincoln. It receives the rivers Ouse, Nen, Welland, and Witham, and has low marshy shores, considerable portions of which have latterly been reclaimed. When the tide is full the whole is under water, but when the tide is out large stretches of sand-bank are exposed. The Boston Deep and Lynn Deep are navigable for sea-going vessels.

**WASHING-MACHINES.** There are various forms of washing-machines for domestic use. A primitive form, called a dolly, is said to have been in use in Yorkshire for more than a century. It consists of a wooden disk, furnished with from three to five legs with rounded ends, and a rod rising from the centre, to which a cross-piece is fitted for working it. The clothes to be washed are put into a tub or box, and the dolly is turned alternately in different directions, thus subjecting them to the action of the water by the jerk, while at the same time the rubbing against the sides and bottom of the vessel materially assists the cleansing process. This mode of washing is, however, only suitable for strong, coarse fabrics; articles of finer texture would be injured by the resulting friction, and to obviate this a floating-ball washing-machine has been invented, which is said to be suitable to all kinds of fabrics. Its special characteristics are the employment of elm-

wood balls about the size of an orange, a number of which are placed in a wooden trough, 2 or 3 feet long by 15 inches wide, containing water or soap-suds. A fulcrum is fixed at the back of the trough, having a long cross-beam like a pump handle working on it. A frame like a small window sash is fixed to this cross-piece, hanging so as to be capable of being immersed in the trough. To this frame the clothes are attached by movable bars, and the washing is performed by moving the cross-piece up and down like an ordinary pump handle, which depresses the frame and clothes among the balls floating in the suds; the balls produce a gentle friction, which, without injuring the texture of the linen, effectually removes the dirt in a short space of time. To lighten the labour of the washer a dead weight is attached to the extreme end of the cross-piece, which counterbalances the weight of the clothes and frame. The dash-wheel washing-machine consists of a vessel with a semicircular bottom, in which works a spoked cylinder or drum, into which the clothes are put. This cylinder is made to revolve backwards and forwards, submitting the clothes to the action of the water, with which the vessel has been filled, and to friction against the spars of the drum. The vessel is provided with a cover for the purpose of keeping in the steam, which acts powerfully on the clothes, bleaching them more effectually than though they had been boiled. Various other machines are in use, most of them having a pair of rollers, through which the clothes are passed for the purpose of wringing, and which may be also used for mangling the clothes.

**WASHINGTON**, one of the United States of America, in the extreme north-west, bounded on the north by British Columbia, on the east by Idaho, on the south by Oregon, from which it is separated chiefly by the Columbia River, and on the west by the Pacific Ocean; area, 66,880 sq. miles. The chief indentations in its coast on the Pacific are the estuary of the Columbia River, Willapa Harbour, and Gray's Harbour; but the principal feature of its coast-line is Puget Sound, with its splendid series of natural harbours, opening to the Strait of Juan de Fuca. Two whole counties in this quarter, San Juan and Island, consist entirely of islands. The Cascade Range runs north and south through the state, dividing it into two very different portions, Eastern and Western Washington, the former of which includes a part known as Central Washington, between the range and the bend of the Columbia River. The highest summits of the range are Mt. Rainier (or Tacoma, 14,444 feet), Mt. Baker (10,827), Mt. St. Helens (9750), and Mt. Adams (9570). Western Washington is traversed by the Coast Range. Among the rivers are, in Eastern Washington, the Columbia, with the tributaries Snake, Spokane, and Colville; in Central Washington various tributaries of the Columbia; and in Western Washington a number of streams. The largest lakes are Chelan, Washington, Union, and Whatcom. The soil in the eastern part of the state is a light volcanic ash of great fertility when sufficiently watered either naturally or artificially, and the principal crops there are wheat, barley, hay, hops, and oats. The Yakima and Kittitas valleys in Central Washington have been rendered exceedingly productive by irrigation; and among the other fertile eastern valleys are those of Walla Walla, Palouse, Colville, Okanogan, and Klickitat, besides the Big Bend country. In Western Washington the cultivated soil is that of the river bottoms and reclaimed tide-marshes, especially in the neighbourhood of Puget Sound, and the chief crops are oats, potatoes, hops, and hay. Vegetables, flax, rye,

maize, and pea-nuts are also cultivated in the state. The dense forests of the western section yield abundance of excellent timber, notably fir, cedar, spruce, hemlock, larch, pine, and maple. The principal minerals raised or found are bituminous coal, gold, silver, iron, lead, copper, zinc, granite, sandstone, and limestone. The mean annual rainfall is in Western Washington 52·5, and in Eastern Washington 16·5 inches, most of it falling from October to March. The mean temperature for the year is 50·4° and 49·7° in these two parts respectively, but the annual range is much greater in the east than in the west. The chief manufactures are flour, lumber, iron, bricks, and furniture, but there are many other kinds of works, especially in Seattle, Tacoma, and Everett. Salmon are caught in large quantities and canned for export, and oyster-fishing is also of importance. The trade of Puget Sound is large and increasing. The state is now well supplied with railroads. For administrative purposes it is divided into thirty-four counties. The capital is Olympia, but several towns, notably Seattle, Tacoma, and Spokane, are larger. The chief educational institution is the University of Washington, located at Seattle. In 1853 Washington was separated from Oregon as a separate territory, and in 1889 it was admitted to statehood. Pop. in 1860, 11,594; in 1890, 349,390; in 1900, 518,103.

WASHINGTON, the capital city of the United States of America, co-extensive with the District of Columbia, situated on the left (east) bank of the river Potomac, at the confluence of the Anacostia or East Branch, 106 miles above its mouth in Chesapeake Bay, about 220 miles south-west of New York, and about 630 miles E.S.E. of Chicago. The District of Columbia is bounded by Maryland on every side except the south-west, where the Potomac separates it from Virginia. The area of the District is 64 square miles, but the actual city occupies only about 10 square miles. It is one of the finest cities in the States, or indeed in the world. The streets are nearly all straight and broad and lined with handsome buildings, and many of them are finely shaded with trees. The centre of the city is the square in which the Capitol stands, and due west from it there extend in succession the Botanic Garden and the large park known as The Mall. Diverging from the Capitol Square at various angles are broad streets or avenues forming the principal thoroughfares of the city. These and other wide streets radiating from squares and 'circles' dominate the more ordinary streets that are arranged on the rectangular plan. The Potomac is crossed by the Long Bridge, for railway trains, vehicles, and pedestrians, and the Aqueduct Bridge; and the Anacostia is spanned by the Navy-yard Bridge and Pennsylvania Avenue Bridge, both of iron. Many of the streets are traversed by tramways, mostly driven by electrical power on the underground trolley plan. Manufactures and commerce are both of comparatively small importance in this city of politicians and officials. The water-supply is obtained from the Potomac.

*Official Buildings.*—The Capitol, situated on a small hill, is the most conspicuous building of the city. It is in classical style, the central part being of sandstone and the two wings of marble. The main façade faces the east, and is adorned with sixty-eight Corinthian columns. The centre of the building is crowned by a large dome surmounted by a bronze statue of Liberty. The whole building is 751 feet long and 285 feet high, and covers an area of 8½ acres. The north wing consists chiefly of the Senate Chamber, and the south wing of the

hall where the House of Representatives meets; and on the north and south sides respectively of the great Rotunda under the dome are the rooms of the Supreme Court and the National Hall of Statuary, to which each state may send statues of two of its greatest sons. The first Capitol, begun in 1793, was burned by the British in 1814. The present central building was erected in 1818–27, and the wings were begun in 1851, the whole being completed in 1863 at a total cost of over £3,000,000. Immediately to the south-east of the Capitol is the New Congressional Library, in Italian Renaissance style, built of granite in 1888–97. It has a fine reading-room and accommodation for 4,500,000 volumes. The other chief official edifices are: the Executive Mansion of the President, popularly called White House, a two-storied stone building with Ionic portico, dating in its present form from 1818, situated in grounds of the extent of 75 acres; the large building containing the State, War, and Navy Departments, of granite, in the Italian Renaissance style; the Treasury building, a large Ionic granite structure; the Department of the Interior, or Patent Office, a large Doric building of stone and marble; the Department of Agriculture, a stone-trimmed brick building in Renaissance style, in The Mall, with good collections; the Department of Justice; the old Post Office, in Corinthian style, occupied by the Department of the Interior; the new Post Office, completed in 1899, with a lofty tower; the huge Pension building, of brick, on Judiciary Square; the City Hall, or district court-house, on the same square; the Washington Navy-Yard, on the Anacostia, with a gun-factory and a museum; the Marine barracks; and the Washington barracks.

*Other Buildings and Institutions.*—The National Museum, in The Mall, is a large square building of brick, erected in 1879–82. It includes extensive collections relating to anthropology, zoology, botany, mineralogy, geology, paleontology, and other branches of science, and is under the management of the authorities of the adjacent Smithsonian Institution, in which large supplementary collections, especially in zoology and American antiquities, are housed. (See SMITHSONIAN INSTITUTION.) In connection with it are a Bureau of Ethnology, an astrophysical observatory, and the National Zoological Park, on Rock Creek, in the north-west of the city. The higher educational institutions of the city comprise: the Columbian University, founded in 1814, now in a building completed in 1883, in the centre of the city; Howard University (1867), open to all, irrespective of colour or sex; Georgetown University, a Jesuit institution founded in 1789; the American University (1891), a Methodist Episcopal post-graduate institution on an elevated site outside the city proper on the north-west; the Catholic University of America (1889), a mainly post-graduate institution in the extreme north of the city; and Gonzaga College. The Botanic Garden, to the east of The Mall, contains a fine fountain in memory of Bartholdi. Other institutions worthy of mention are: the Army Medical Museum, in The Mall, with a large library and several collections; the United States Fish Commission building, in The Mall, with an aquarium; the United States Fish Ponds, in the west of The Mall; the Naval Observatory, and the Signal Office and Weather Bureau. The benevolent institutions include the Columbia Institute for the Deaf and Dumb; the Soldiers' Home, in a park named from it, in the extreme north of the city; and various hospitals and asylums. The National (or Arlington) Cemetery, on the west of the Potomac, contains the graves of about 16,000 soldiers, among them those of Sheridan

and Sherman, and also Arlington House, a former residence of General Lee.

*Monuments, Galleries, &c.*—The greatest monument of the city is the Washington monument in the western part of The Mall. It is an obelisk of marble 555 feet in height, and can be ascended in the interior by a long flight of steps or by an elevator. It was completed in 1884, after fourteen years of actual building, at a total cost of more than a quarter of a million sterling. The other monuments in the city include those of Franklin, Washington, Lincoln, Garfield, and many other eminent men. The Corcoran Gallery of Art, in a fine classical white marble building erected in New York Avenue in 1894-97, contains sculptures by Powers, Rauch, Canova, and others, and paintings by G. F. Watts, J. Faed, Morland, Ary Scheffer, Corot, Troyon, Ersline Nicol, Mengs, Gérôme, and others.

*History.*—The site of Washington was selected for the federal capital in 1790, and the federal district (see COLUMBIA, DISTRICT OF) was laid out on territory ceded by Maryland and Virginia. The part ceded by the latter state was retroceded in 1846. The city was planned by Major L'Enfant, and in 1791 the present name was adopted. The seat of government was removed here from Philadelphia in 1800. The city was captured by the British in 1814, and the Capitol and other public buildings were burned. From 1802, the date of its charter, till 1871 it was governed municipally, but from the latter year to 1874 the government was territorial. Since 1874 it has been governed by three commissioners appointed by the President, and all questions of finance and general improvement are determined by Congress. Pop. (1800), 3210; (1890), 230,392; (1900), 278,718.

WASHINGTON, GEORGE, was born in Westmoreland county, in the North American colony of Virginia, on the 22d of February, 1732, and was great-grandson of John Washington, a gentleman of the south of England, who emigrated in 1657. The education of young Washington extended only to the ordinary branches of reading, writing, and arithmetic, with the addition of book-keeping and surveying. His inclinations, it seems, led him to adopt a sea-life, and when fourteen years old he obtained the commission of a midshipman in the British navy, but relinquished that service by the pressing entreaties of his mother. After this he spent three years in surveying a part of the extensive estates of Lord Fairfax in Virginia, an undertaking fraught with danger, owing to the lawlessness of the border population and the treachery of the surrounding Indian tribes. When only nineteen years of age he was appointed adjutant-general of the Virginia militia, with the rank of major. Some time later he was appointed envoy to the French commandant on the Ohio, to remonstrate against certain encroachments of his troops upon the province of Virginia. Upon his return he was made lieutenant-colonel of a regiment which had been ordered to proceed against the French, the answer of the commandant not having proved satisfactory. He had not proceeded far when the command devolved upon him by the death of the colonel, and his services in this campaign obtained the thanks of the legislature of Virginia. Soon after he resigned his commission and retired to Mount Vernon, an estate on the banks of the Potomac, to which he had lately succeeded by the death of his brother, purposing to devote himself to the occupations of a country life. In 1755 he joined the forces under General Braddock as a volunteer, and was the only officer of note who escaped unhurt from the disastrous ambuscade of 9th July, though four bullets had passed through his coat, and two horses were

shot under him. In 1758 he held the chief command of the Virginia contingent in General Forbes's expedition against Fort Duquesne, but the following year he resigned his military appointments, married Mrs. Martha Custis, a wealthy widow of his own age, and devoted his time to the management of his estates, raising wheat and tobacco, and carrying on brick-works and fisheries, assisted, like almost all the American landholders of the period, by slave-labour. He sat for some years in the Virginia Assembly, and like many of his compatriots was at first opposed to the idea of independence, but resolved to fight should the grievances of the colonists obtain no redress. Shortly after the outbreak of the war Washington was elected commander-in-chief of the American forces (15th June, 1775). To relate his life in that capacity would be to write the history of the war of independence, which we have already briefly traced in the historical section of our article on the UNITED STATES. It is sufficient to say that the struggle was carried on by him under every possible disadvantage. Neither he nor his subordinates had any experience in handling large masses of troops; the continental congress had no power of taxation, and no right to compel the obedience of the individual; the country had no foundries, no arsenals, no forts, no navy, no funds, no credit. Britain, on the other hand, had the prestige of the legitimate authority, of disciplined armies, of a powerful navy, of the military possession of many of the important towns, and of the machinery of government for peace and war, together with the expressed sympathy of a considerable number of the colonists, especially of the wealthier classes. His first task was the re-organization of the army, the difficulty of which was seriously increased by the want of discipline, sickness, and desertion among his men, the unfriendliness of his officers, and the interference of the civil power. No event of interest occurred during the first eight months, but at last Washington succeeded in fortifying Dorchester Heights, which compelled the British to evacuate Boston, 18th March, 1776. In 1781 the struggle was virtually closed by the surrender of Lord Cornwallis at Yorktown; in 1783 the British evacuated New York, peace was signed, and the independence of the States recognized. On the 23d December Washington resigned his commission as commander-in-chief, and retired to Mount Vernon to resume his occupation as a farmer and planter. He refused all recompense for his military services, and only consented to accept a sum which covered his personal expenses. On his return from a journey across the Alleghanes he laid before the legislature of Virginia a memoir respecting the junction of the head waters of the rivers in the interior of that state; this led to the organization of the companies who constructed the James River and Potomac Canals. For his valuable service and advice on this occasion the state voted him 150 canal shares, valued at 60,000 dollars, which he applied to the endowment of Washington College, Lexington, and of a university at the seat of the federal government. After four years of retirement he was elected the first president of the new republic, and inaugurated 30th April, 1789, and again in 1793. At the close of his second term of office, disgusted with the factious opposition of the Republicans, headed by Jefferson and Randolph, he resigned (1797) and once more retired to his estates. Shortly afterwards, when a misunderstanding arose between the United States and France owing to a vexatious commercial policy pursued by both countries, measures of military and naval preparation were adopted by the Congress, and Washington was appointed lieutenant-general of the forces of the United States, but he had not to take the field in

actual fighting. On the 12th December, 1799, while taking his usual ride round his farms, he was overtaken by a violent storm of snow, which latterly turned into a settled cold rain. He was attacked with acute laryngitis, for which he was profusely bled, but he sank rapidly, and died on the 14th December. He had a mind far above party strife, and was mourned by men of all parties. General Lee only expressed the universal sentiment when he described him in his funeral oration as 'first in war, first in peace, and first in the hearts of his countrymen.' Throughout his whole career he showed himself true, just, and brave. He was a man of deeds, not words, and his success was as complete as his task was unique and difficult. He had no family.

WASP, the name given collectively to various genera of Hymenopterous insects, belonging chiefly to the family Vespidae, in which the head-shield is of square shape, and the mandibles or greater jaws short and toothed at their tips. The wings are folded longitudinally when at rest. The antennae of the males are thirteen-jointed, those of the females and neuters being twelve-jointed. The abdomen is egg-shaped, and the mandibles oblique at the tip in the genus *Vespa* itself. The Wasp colony, like that of the common bees, consists of three groups of individuals—males, females, and neuters or workers. The community lasts for about a year only, and breaks up at the commencement of cold weather; the males being then dead, and the workers dying off, whilst the females hibernate in holes in trees. The females build nests in spring, and hatch larvae therein, which develop into workers. These latter devote their time and attention to the care of succeeding larvae, which the mother of each hive produces. The nests are built of a kind of paper manufactured from woody-fibre obtained from leaves, the surface of palings, tree-bark, &c. The females and workers are armed with stings. The largest British Wasp is the Hornet (which see). The Wood or Bush Wasp (*V. sylvestris*) is a very common species, which builds nests under roof-eaves, or attached to walls, trees, or bushes. The *Vespa vulgaris* or Common Wasp makes a nest in the ground, and the genus *Odynerus*, or Burrowing Wasps (included in the family Eumenidae), represented by the *O. parietum* of France, constructs a tunnel-like nest of complicated form. These latter are sometimes named False Wasps, and are little black insects banded with yellow. A near ally of *Odynerus* is *Eumenes pomiformis*, an insect of black colour with yellow wings, and which builds its nests on walls. The genus *Eumenes* has the basal segment of the abdomen of narrow shape, and forming a pedicel or foot-stalk. These are solitary wasps, which develop no neuters in their colonies, and which possess long mandibles and a shortened thorax. Other genera of Wasps include the well-known *Polistes Gallica*, which has the yellow bands continued on the antennae. These Wasps have long bodies, and have the pedicel-like abdomen described in the genus *Eumenes*. The Wasps of the genus *Polistes* build nests of papery material, and attach them to bushes and shrubs. *Polystia lilacea* constructs a nest 4 feet high, containing thousands of cells, and attached to branches of trees. The Paperboard Wasps (*Chartergus*) make nests of a material resembling card-board. *C. nidulans* of Brazil constructs a nest of a beautifully white appearance externally. A group of Hymenopterous insects, very much resembling bees and wasps in appearance, and also furnished with stings, are known as Sand Wasps. They inhabit the warmer countries, and live solitary. One of them, the *Ammophila sabulosa*, is shown at ENTOMOLOGY, Plate II., fig. 29.

WATCH, a well-known pocket instrument for

measuring time. Little is known of the early manufactures of watches; there is authority for the opinion that they were made of some form at Nürmberg as early as 1477. Henry VIII. of England and the Emperor Charles V. are both well known to have possessed watches, and in Shakspeare's time they were worn by private individuals, as we learn from his Twelfth Night, in which Malvolio is made to say:—'I frown the while; and perchance wind up my watch, or play with some rich jewel.' Some of these early watches were oval, and as small as those of the present day, others were as large as dessert plates; they were all imperfect measurers of time. The wheels in modern watches and in spring clocks are moved by the force of a spiral spring (a thin steel ribbon) inclosed in a hollow cylindrical barrel or box; the inner end of this spring (called the main-spring) is fastened to the axis, or arbor of the barrel, and the other end to the inner wall of the barrel. In winding up a watch the spring is coiled up round the arbor, and by its tendency to uncoil itself it sets the barrel in motion. As the elastic force of the spring is greatest when it is fully coiled up, it would act unequally on the train of wheels, unless some means were taken to modify it. This is effected by the fusee, a cone with a spiral groove cut on it; it is connected with the barrel by a chain, one end of which is attached to the bottom of the fusee and the other to the outside of the barrel. The watch is wound up by placing or turning the fusee by a key applied to the end of its axis, this winds the chain along the spiral groove of the fusee, winding it off the barrel, every revolution of which helps to coil up the main-spring. When the spring is fully coiled up, and allowed to operate, the chain acts on the small or upper end of the cone, where it has the least leverage; as the force of the spring gradually lessens the chain reaches the broader parts of the cone, and the leverage increases. The fusee connects with the first or great wheel of the watch (their centres coinciding), by a ratchet and click, which admits of the fusee being turned backwards in winding, and by means of a stiff spring sometimes set in the great wheel the motion of the train is maintained while the watch is being wound up. The French, Geneva, and American watchmakers generally dispense with the fusee and chain and fix the great wheel on the barrel. It has been discovered that there is a position of every spring in which its force does not materially vary for four or five turns; and if the spring is such that this position occurs just at the right degree of tension for using it in a watch barrel, it is evident that it may be used for a main-spring without any further provision for equalizing its force. The other wheels and pinions which constitute a watch movement are essentially the same as those of a clock (see CLOCKWORK), until we come to the escapement. The old watches were provided with the vibrating balance in the form of a heavy ring the same as now used; the spiral hair-spring, which gives the compensated balance wheel all the perfection of the best pendulum, was invented and applied by Dr. Hook about 1658. One end of this spring is attached to the axis of the balance wheel, round which it is loosely coiled, and the other end fixed to the frame. Any alteration in the length of the spring affects the number of the vibrations in a given time, and advantage is taken of this principle to regulate the watch. A pointer or regulator turning on a ring, fixed to the watch-plate, concentric with the balance, is provided with two small pins called *curb-pins* just close enough together to embrace the spring, and as the regulator is moved to the left or to the right the vibrating portion of the spring is lengthened or shortened, and therefore the movement will be slower or

faster. The escapements are numerous, but only those still in use can be mentioned. The vertical escapement consists of two pallets (see CLOCK-WORK) placed in a different plane on the arbor of the balance wheel; these pallets fit into the teeth of the crown wheel, whose revolution thus communicates motion to the balance. This form of escapement is going rapidly out of use. The lever, now generally employed in the best watches, except chronometers—is the invention of Berthoud, a French watchmaker, and improved by Mudge of London. It is distinguished by the scape-wheel acting upon the balance through a lever with a pallet at each end. In the horizontal or cylinder escapement the impulse is given to a hollow cut in the cylindrical arbor of the balance by teeth of a peculiar form set on a horizontal crown wheel. In the duplex escapement the scape-wheel is furnished with two sets of teeth; one set is of short pins standing on the rim of the wheel, and these give the impulse; the other set are the usual teeth for interlocking; this escapement works with great accuracy, but it is extremely delicate and easily deranged. The detached or chronometer escapement, originally a French invention, but perfected in England by Earnshaw and Arnold about the close of last century, is characterized by the balance being free or detached from the scape-wheel in its vibrations, except at the instant of receiving the impulse, as each tooth impinges in succession on the pallet attached to the arbor of the balance. On this impulse being communicated a little cam, also on the arbor, runs under the point of a straight steel spring fixed to a piece called the detent, and lifts this, together with the tooth attached to it that checks the scape-wheel; the balance with its pallet and cams swings round, and as it vibrates back, the cam moves the little spring forward to admit its passing, and the pallet receiving another impulse the movement is repeated. As variations in temperature would, as in clocks, produce variations in the rate of movement, this has to be duly provided for. The balance-wheel of the best watches is made of brass and steel, as in the case of the gridiron pendulum (see CLOCK-WORK), the brass forming the outer circumference, the steel the inner, and is weighted by brass knobs or weights. As the temperature rises the brass expands and bends the steel inwards, bringing the weights nearer the centre, and so increasing the inertia of the balance. In setting watches to time the hands of a pocket chronometer or a duplex watch should never be turned backwards; in other watches this is of no consequence.

WATER, a universally-diffused liquid, the true nature of which was not discovered till towards the close of the 18th century. In 1781 Cavendish carried out a series of experiments by detonating mixtures of common air and hydrogen, or dephlogisticated air, as it was termed. He showed that by regulating the relative quantities 'almost the whole of the inflammable and dephlogisticated air is converted into pure water.' Although Cavendish showed experimentally that water is produced by bringing together oxygen and hydrogen, yet to Lavoisier, who received information regarding Cavendish's experiments, must be assigned the merit of interpreting aright the experimental results, and of proving that water was a compound substance—a compound of hydrogen and of oxygen. The discovery has also been claimed for Watt, but it would appear without good grounds. Water may be produced by exploding a mixture of two volumes of hydrogen with one volume of oxygen; by passing hydrogen over many heated metallic oxides; and in various other ways. It exists, although never in a perfectly pure state, in immense quantities in nature. The

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composition of water has been determined by two distinct methods: 1, by volumetric synthesis; 2, by gravimetric synthesis. In volumetric synthesis of water measured volumes of pure dry hydrogen and of pure dry oxygen are mixed, and the mixture is exploded by the electric spark while standing over mercury; the residual volume of gas is then measured; it is found that two volumes of hydrogen invariably unite with one volume of oxygen. In the second method a weighed quantity of a metallic oxide (usually cupric oxide) is decomposed by means of pure dry hydrogen at a high temperature, and the water which is produced is weighed. The decrease in weight of the oxide gives the quantity of oxygen in the water formed; while the difference between the total weight of water and the weight of the oxygen gives the weight of hydrogen used. It is found that 16 parts by weight of oxygen are always united with 2 parts by weight of hydrogen to form 18 parts by weight of water. As 16 is taken to be the atomic weight of oxygen the formula of water is  $H_2O$ .

Water is a colourless, tasteless, inodorous liquid. At all temperatures below  $0^{\circ}C$ . it is a solid, and at all temperatures above  $100^{\circ}C$ . it is a gas. When water at  $0^{\circ}$  is heated it contracts until it reaches the temperature of  $4^{\circ}C$ ., after which it expands; conversely, when water at  $100^{\circ}$  is cooled it contracts until it reaches the temperature of  $4^{\circ}C$ ., after which it expands.  $4^{\circ}C$ . ( $=39^{\circ}.2F$ .) is called the point of maximum density of water; the specific gravity of water is greater at this than at any other temperature. The fact that water expands on cooling from  $4^{\circ}$  to  $0^{\circ}$  is a most important one. If a sheet of fresh water be cooled the upper layers become more and more dense; they therefore tend to sink, and so fresh surfaces are exposed to the cooling influences. But when the temperature of the mass of water has reached  $4^{\circ}$  any further cooling of the surface causes an expansion of the upper layers, which continues until these become ice; these layers of cold water consequently float upon the warmer water underneath; hence it is impossible for the mass of water to suddenly freeze throughout. When water passes from the liquid to the solid state it expands to the amount of about  $\frac{1}{11}$ th of its volume. This expansion is sufficient to bring about a large quantity of mechanical work; and to it the bursting of water-pipes during frost is to be largely traced. When solid water becomes liquid, or when liquid water becomes gaseous, a considerable quantity of heat is rendered 'latent.' Steam issuing from boiling water is no hotter than the water itself; water formed when ice is melting is no hotter than the ice itself; yet heat is being communicated to the ice and to the water. The latent heat of water is 79 thermal units; the latent heat of steam is 536 thermal units. In other words, in order to convert unit weight of ice at  $0^{\circ}$  into water at  $0^{\circ}$  a quantity of heat must be communicated to the ice, which, if communicated to unit weight of water at  $0^{\circ}$ , would raise its temperature to  $79^{\circ}C$ . In order to convert unit weight of water at  $100^{\circ}$  into steam at  $100^{\circ}$  such a quantity of heat must be communicated to the water as would suffice to raise the temperature of that weight of water through  $536^{\circ}C$ ., or 536 times that weight of water through  $1^{\circ}C$ . Before vapour can become steam the upward pressure of its vapour must overcome the downward pressure of the atmosphere; hence it follows that the boiling point of water is conditioned by the atmospheric pressure. Water boils at a much lower temperature on mountain tops, where the pressure is comparatively small, than in the valleys.

The solvent power of water is very large. As a rule hot water dissolves larger quantities of solid matter than cold. As has been mentioned water



is never found in nature in a state of purity. The different kinds of natural waters may be divided into three groups:—1, *Rain water*; 2, *river water*; 3, *spring*, including *mineral water* and *sea water*.

*Rain water*, when collected before it touches the earth, contains only such impurities as may be derived from the atmosphere, chiefly consisting of oxygen, nitrogen, and carbon dioxide. The rain water of towns contains comparatively large quantities of acids and of soluble salts. The amount of these substances may be taken as an estimate of the comparative purities of the atmospheres of different towns. Rain water collected near the sea is rich in chlorides.

*River water* varies greatly in so far as the nature and quantity of the substances held in solution by it are concerned. The soluble constituents of river water are chiefly such as may be derived from the rocks through which the water of the springs which have fed the river has percolated. The dilution of the original spring water by the continual influx of tributaries reduces the relative quantity of solid matter held in solution, while the escape of carbon dioxide during the exposure of the surface water to the air causes the precipitation of those salts which were held in solution by the aid of the carbonic acid. River water is often largely contaminated by the drainage of towns or of manufactories situated on the river banks.

The soluble constituents of *spring waters* are very various. In some springs the quantity of dissolved solid matter is but trifling, while in others it amounts to 2000 grains per gallon. Spring waters are usually divided into classes in accordance as one or other dissolved constituent predominates. Thus we have—

A. CARBONATED WATERS, in which the dissolved mineral matter consists chiefly of carbonates. In accordance with the metallic carbonate chiefly present this group is subdivided into: 1. *Alkaline*, in which carbonates of the alkalis predominate. 2. *Magnesian*, in which carbonates of magnesium predominate. 3. *Calcareous*, in which carbonates of calcium predominate. 4. *Chalybeate*, in which carbonates of iron predominate.

B. SULPHATIC WATERS, in which the dissolved mineral matter consists chiefly of sulphates.

C. CHLORINATED WATERS, containing chiefly chlorides. These groups are also each subdivided into four sections.

D. SULPHURETTED WATERS, containing large quantities of sulphides or of sulphuretted hydrogen.

The waters of the wells of Ems and of Vichy are examples of carbonated alkaline waters. Carlsbad is an alkaline sulphatic; Bath a calcareous sulphatic; Homburg and Wiesbaden are alkaline chlorinated; and Harrogate is a sulphuretted water.

*Sea water* is essentially an alkaline chlorinated water. The quantity of solid matter held in solution varies in the waters of different seas. Inland seas, as a rule, contain less solid matter than the ocean; thus the solid content of the water of the Black Sea amounts to about 1760 parts per million, while that of the Baltic averages 17,700, and that of the Atlantic Ocean 86,000 parts per million. The constituents of sea water are chiefly chlorides and sulphates of sodium, magnesium, and potassium, together with bromides and carbonates, chiefly of potassium and calcium.

In considering the suitability of a water for domestic use attention should be principally paid to (1) the source of the supply, (2) the total solid matter held in solution by the water, (3) the organic matter held in solution, and (4) the action which is likely to be exercised on the water by the means of supply. Let us consider these points briefly. In

examining the source of a water supply attention should be especially paid to the proximity of drains or sewers of any description, and to the likelihood of contamination from these sources. The nature of the soil through which the water percolates should also be inquired into. The solid substances held in solution by a sample of water may be estimated by evaporating a measured quantity of the water to dryness in a platinum basin heated by steam, and weighing the residue. From a knowledge of the total solids in a water, unaccompanied by any further information, no reliable conclusion as to the suitability of such a water for potable purposes can be deduced. In seeking to determine whether a sample of water has undergone contamination with hurtful organic matter the following points are to be more particularly attended to:—(1) Estimation of the amount of chlorine, whether existing as hydrochloric acid or as a chloride; (2) estimation of ammonia; (3) estimation of nitrates; and (4) detection, and estimation, if necessary, of poisonous metals. The presence of an undue amount of chlorine generally points to contamination with animal matter.

Pure waters do not as a rule contain more than 3 to 4 grains of chlorine per gallon. It must, however, be borne in mind that such waters as flow through a soil rich in chlorides—such, for instance, as the waters found in the neighbourhood of the Cheshire salt-beds—always contain large quantities of chlorine. The sudden appearance of chlorides in a water previously free or nearly free from these substances points to animal contamination.

Ammonia may be obtained from most waters by distillation after the addition of a little sodium carbonate; when the whole of this ammonia has been driven off it not unfrequently happens that the addition of an alkaline solution of permanganate of potassium and heating results in the production of a further quantity of ammonia. The ammonia obtained by the first distillation is usually spoken of as 'free ammonia,' while that obtained by the second distillation the name of 'albumenoid ammonia' is given. The presence of even small quantities of albumenoid ammonia points unmistakably to organic contamination. Such ammonia is derived from the decomposition, by the agency of the alkaline permanganate liquid, of nitrogenous matter of animal or vegetable origin. Pure water should not contain more than 0.10 parts of 'free' ammonia per million, nor more than 0.08 parts of 'albumenoid' per million.

If nitrogenous matter has become thoroughly oxidized it gives rise to the formation of nitric and nitrous acids. The presence of these acids or of their salts therefore generally points to previous contamination of some organic nature. As, however, these things are the harmless—that is, in the quantities in which they occur in waters—products of the decomposition, and therefore of the removal, of hurtful substances, their presence, even when in comparatively large quantities, ought not of itself to condemn a water.

The poisonous metals which are most likely to occur in drinking waters are lead and copper. These may be easily detected and estimated even when present in exceedingly minute quantities. For details of the analytical methods of water analysis reference must be made to manuals of applied chemistry. It is evident that in a water analysis we look for symptoms of a disease; not for substances which are in themselves hurtful, but for substances whose presence is associated more or less invariably with others, the action of which upon the system cannot but be most pernicious.

In storing water for domestic purposes the water may undergo contamination from the vessels containing it



or from proximity to drains or other places emitting noxious gases. It is certain that water exercises a solvent action upon lead; but our ordinary leaden water cisterns become coated with a comparatively insoluble compound of lead, so that the danger of contamination from this source is not great. Hot water should never be stored in leaden cisterns; it very quickly corrodes and dissolves the metal. Aërated waters act rapidly on lead; for this reason they should never be prepared in leaden vessels. The solvent action of water on copper is very small. The system of storing water for drinking or cooking in cisterns close to, or even communicating with, the house drainage system, is a very bad one. (See SEWAGE, also SANITARY SCIENCE.) In some circumstances, as in the case of swimming-baths, for instance, large quantities of water have to be heated to a certain temperature and kept at the same for a considerable time while the water has to be maintained in a due condition of purity. How to accomplish this in the most effective and economic manner becomes a question of importance, the most satisfactory answer to which seems to be given by the system known as the 'Roshier system' of heating and aëration. By this system the water is not only rapidly heated and maintained at an equal temperature throughout, but by causing a constant circulation and forcing the water through an aërating filter the requisite purity is attained, and the great expense of frequently changing the water avoided.

**WATER-BED**, a contrivance for relieving any partial pressure of the body of a patient long confined to bed, and so preventing the formation of ulcers (bed-sores) which arise from such local pressure. These beds are of various kinds. One form is that of a trough half-filled with water, covered by a loose lining of india-rubber sheeting attached all around to the upper edge of the trough so as to be water-tight, a mattress being laid between the invalid and the lining. Another form is that of a large waterproof bag which is laid upon an ordinary mattress and half-filled with water, the weight of the body resting upon this directly or with bed-clothes between. Many practitioners prefer air-beds made upon a similar principle.

**WATER-BEETLE**, the general name given to various species of Coleoptera or Beetles, inhabiting water and belonging to the family Dytiscidæ (or Dyticidæ). The legs in these insects are adapted for swimming, the two hinder pairs being flattened and fringed with hairs. The body is oval and flattened. The mandibles are short and strong, and the thorax is broad. The front legs are short and the antennæ long. In the genus *Dytiscus* (or *Dyticus*) the tarsi of the males are wide and flat. The head is short, and received into the thorax. *D. marginalis* (see ENTOMOLOGY, Pl. I., fig. 37) is the Great Water-beetle of our ponds. These insects carry a supply of air for breathing beneath the *elytra* or wing-covers. At evening these beetles fly in the air. They are eminently carnivorous in habits, and feed on other insects. The larvæ are active creatures, and are also aquatic in habits. The genus *Ilybius*, of which *I. ater* is a familiar example, is another common genus of Water-beetles. This genus has smooth *elytra*, with a convex body, and the second and third joints of the labial palpi nearly of equal size. The Gyrinidæ, Whirlwig, or Whirligig Beetles, are also aquatic in habits. They possess short front legs and antennæ, and the *elytra* do not cover the tip of the body. They derive their familiar name, and also their French *sobriquet* of *Tourniquets*, from their peculiar habit of describing circles on the surface of the pools they inhabit. The Common Whirlwig (*Gyrinus natator*) is shown in Pl. I. at ENTOMOLOGY, fig. 38. Another

family of water-beetles is that of Hydrophilidæ, an example of which, the *Hydrophilus piceus*, is shown on the same plate. These beetles live on vegetable substances, but their larvæ are carnivorous.

**WATER-BOATMAN** (*Notonecta glauca*), a species of Hemipterous insects, belonging to the section Heteroptera and to the family Notonectidæ. These insects are so named from their habit of swimming on their backs (Greek *nôtos*, back, *nêktos*, swimming), and of propelling themselves by their hinder legs. They also possess powerful wings, and make nocturnal flights. They are common in summer in all our pools. See Pl. III., fig. 35, at ENTOMOLOGY.

**WATERBURY**, a city of the United States, in New Haven county, Connecticut, in a valley on the Naugatuck River, and at the junction of two important railway systems, 75 miles N.E. of New York. The principal streets radiate from a fine public park in the centre of the city. The chief public buildings are an elegant city-hall (containing court-house and corporation offices), many churches, a high-school and other first-class educational institutions, a number of public schools, an excellent free library, a public hall, &c. There are rolling-mills, machine-shops, clock and watch factories, tool-works, extensive manufactures of brass goods, such as tubing, kettles, wire, burners, &c. Pop. (1890), 33,202; (1900), 51,139.

**WATER-CLOCK**. See CLEPSYDRA.

**WATER-CLOSET**. See SEWAGE.

**WATER-COLOURS** are prepared from any of the ordinary pigments that work well in water, such as cobalt, Indian red, gamboge, purple madder, burnt umber, ivory black, made into a stiff and perfectly smooth paste with gum-water or isinglass size, or a mixture of the two, and then compressed in polished steel moulds and dried; or they may be so treated as to keep in a moist state, either in flexible metallic tubes or otherwise. The above are for drawings on paper; the colours used for wall-papers and by the scene-painter are less delicately prepared with size or glue. Water-colours have always been used more or less in drawing and painting; but water-colour painting as a rival of oil-painting is of modern origin. See DISTEMPER, ILLUMINATING, MANUSCRIPTS, and PAINTING.

**WATER-CRESS** (*Nasturtium officinale*), a cruciferous plant distributed throughout Europe, Western Asia, North Africa, introduced into North America and the colonies, and choking some rivers of New Zealand. It grows on the margin of clear streams, or even partly immersed in the water. The stem is decumbent at the base, upright, and somewhat branching above, and a foot or more in length. The leaves are smooth and pinnatifid, with the lobes more or less sinuate on the margin, and the terminal one always largest. The flowers are small and white; pod linear. The plant has a pleasant, pungent taste, and is employed as an antiscorbutic. Great quantities are consumed as salad; and it is cultivated to a considerable extent in many places. In the bed of a clear stream the plants are inserted in rows in the direction of the current; and all that is necessary is to take up and replant occasionally, to keep them free from mud, weeds, &c.

**WATER-CURE**. See HYDROPATHY.

**WATERFALL**. See CATARACT.

**WATER-FLEA**, a general name given to various genera of small crustaceans belonging to different orders of the class Entomostraca. The commonest genera of these animals are the *Cypris* and *Cyclops*, shown on plate at Crustacea, figs. 31, 32. Of the latter, the *C. quadricornis*, belonging to the order Copepoda, is one of the best-known species. This little crustacean is very common in water which contains vegetable matters. It has the head and chest pro-

tected by a carapace or shell, and a prominent jointed tail exists. A single large eye is developed in front of the head, and behind this two pairs of antennæ exist. The feet number five pairs, and are used for swimming. The young appear to undergo a metamorphosis, and first appear as Nauplius forms. (See NAUPLIUS.) The females are larger and more numerous than the males, and are recognized by their two external ovisacs or egg-sacs attached to the tail. A single congress with the males appears to fertilize the females for life. Equally common water-fleas are those included in the genus *Cypris*, of which *C. tris-striata* is a good example. *Cypris* belongs to the order Ostracoda, in which the entire body is inclosed in a bivalve 'shell', and the gills are borne by the posterior jaws. The feet are not used for swimming. These forms swim about by means of tail-bristles. The females are fertilized once and for life by the males; and the young females appear to be capable of producing young by a process of *parthenogenesis* (which see). *Daphnia pulex* (see same plate, fig. 30), or 'the Branch-horned Water-flea', belongs to the order Branchiopoda (*Cladocera*), in which group the head is distinct, and the body inclosed in a carapace or bivalve shell. The head bears a single eye, and the mouth bears two mandibles or larger jaws, and two maxillæ. The gills are borne by five pairs of legs attached to the thorax. The larger pair of antennæ give the name to this species, being branched and serving for swimming. The males are smaller and fewer in number than the females. The summer eggs of *Daphnia*, numbering from ten to fifty, are retained between the halves of the shell and hatched in that situation. The winter eggs are two in number, and are borne in a peculiar receptacle which is cast off and floats about, the eggs being hatched by the returning heat of spring.

The name of Water-fleas is also given to the insects of the family Hydrometridæ, of which one species, *Hydrometra paludum*, is figured on Pl. III. at ENTOMOLOGY, fig. 32. These insects run about on the surface of pools with the greatest lightness and agility. They live on small insects.

**WATERFORD**, a county of Ireland, province of Munster, bounded north by Tipperary and Kilkenny, being separated from the greater part of the one and the whole of the other by the Suir; east by Wexford, from which it is separated by Waterford harbour; on the west by Cork; and south by the Atlantic; area, 461,552 acres, of which a sixth is under tillage, fully a half in pasture, a twenty-third in plantations, and a quarter in waste, bog, mountain, &c. The coast is in general bold and rocky, but besides the harbours of Waterford and Youghal, at its east and west extremities respectively, has the deep indentations of Dungarvan Harbour and Tramore Bay. The interior is rugged and mountainous, being covered by the Comeragh range, which in Monavallagh rises to 2598 feet, and in the Knockmeledown range to 2700 feet. The eastern part of the county, with the exception of the extreme east, which is Old Red Sandstone, is principally slaty rock, but greatly broken up by igneous rocks; while the entire west and the northern border is Old Red Sandstone, but penetrated by a wide valley of mountain limestone running east and west from Dungarvan to Tallow. The minerals include copper and marble, both of which are worked; and also iron and lead. The principal rivers are the Suir, navigable to Waterford by large, and to Carrick-on-Suir by small vessels; and the Blackwater, by which vessels of 100 tons ascend to the junction of the Bride, and of 70 tons to Cappoquin. The climate is moist, and the surface, partly covered with bog, is

much better adapted to pasture than agriculture. The dairy is the most important branch of rural economy, and furnishes a large export of butter. The only other large export is bacon. The coast fisheries employ a good number of people. The county sends two members to Parliament. Pop. (1881), 112,768; (1891), 95,702; (1901), 87,187.

**WATERFORD**, a city, parl. and county borough, and seaport, in Ireland, capital of the above county, 97 miles s.s.w. of Dublin, with which it is connected by railway, on the right bank of the Suir, here crossed by a wooden bridge 832 feet long, opening in one place to allow vessels to pass, and communicating with the suburb of Ferrybank. It stretches along the Suir for about 1 mile, consists in the more modern parts of wide and airy streets and well-built houses; but in the older quarters of irregular and narrow streets, with ill-arranged, dilapidated houses. The principal buildings are the Episcopal and the Roman Catholic cathedrals, the Protestant hall, the town-hall; the custom-house and post-office, the model school, the college of St. John (R.C.), the united city and county jails and court-houses, the lunatic asylum, the Dominican chapel, and the Methodist church. There are several convents, hospitals, and other charitable institutions. The quay extends 1200 yards along the river, with a general width of 40 yards, and has sufficient depth of water to allow vessels of 4000 tons to discharge their cargoes. The exports, chiefly to England, are bacon, pork, butter, eggs, poultry, fish, grain, flour, meal, cattle, sheep, and pigs. There are several large bacon-curing establishments, two breweries, two saw-mills, and two steam flour-mills. Waterford sends one member to Parliament. Pop. (1891), 26,203; (1901), 26,769.

**WATER-HEN**. See GALLINULE.

**WATER-LILY** (*Nymphaeaceæ*), an order of beautiful aquatic plants, the greatest ornament of our lakes and slow-moving waters. Their roots are large and fleshy, often creeping horizontally at the bottom of the water. The leaves are peltate or heart-shaped, supported on a stalk so long as to permit them to float on the surface. The flowers are large and showy, and contain numerous petals, which pass by a gradual transition out of the sepals into the stamens. In the morning they raise themselves out of the water to expand, and close again, reposing upon the surface in the afternoon. *Victoria Regia* (which see), the Victoria Water-lily, the most magnificent of the order, is found in the still waters of the warm parts of Eastern South America. It is plentiful in the rivers Essequibo and Amazon. The *lotus* of Egypt (*Nymphaea lotus*) has flowers of a pink colour, and the margin of the leaves toothed. It grows in vast quantities in the plains of Lower Egypt, near Cairo, at the time they are under water. The roots are oblong, tuberous, as large as an egg, blackish externally and yellow within, and are eaten cooked in various ways. The seeds are also used in some districts to make a sort of bread. The yellow water-lilies are classed in a genus under the name of *Nuphar*. They are much less ornamental than the preceding, and differ essentially in the form of the flower. *Nelumbium speciosum*, the Sacred Water-bean, allied to the water-lily, is said to be the Egyptian lotus represented on Egyptian and Indian monuments. See LOTUS.

**WATERLOO**, a village of Belgium, on the road from Charleroi to Brussels, about 10 miles from the latter city, at the entrance of the forest of Soignies. A short distance from this village occurred, June 18, 1815, the memorable battle which finally shattered the power of Napoleon. After the engagement at Quatre Bras, and in consequence of the battle of

Ligny, Wellington had retired to the forest of Solignies, and, June 17, occupied an advantageous position on the heights about a mile and a half in front of the village of Waterloo. Blücher, who had concentrated his troops at Wavre, about 10 miles distant, having promised to support him, he here resolved to risk a battle. The British army was divided into two lines. The right of the first line consisted of the second and fourth British divisions, the third and sixth Hanoverians, and the first corps of Belgians, under Lord Hill. The centre was composed of the corps of the Prince of Orange, with the Brunswickers and Nassauers, having the guards under General Cooke on the right, and the division of General Alten on the left. The left wing consisted of the divisions of Picton, Lambert, and Kempt. The second line was placed behind the declivity of the heights to the rear in order to be sheltered from the cannonade, but sustained much loss from shells during the action. The cavalry were stationed in the rear, and distributed all along the line, but chiefly posted on the left of the centre to the east of the Charleroi causeway. The farm-house of La Haye Sainte in the front of the centre was garrisoned; but there was not time to prepare it effectually for defence. The villa, gardens, and farm-yard of Hougoumont formed a strong advanced post towards the centre of the right. The whole British position formed a sort of curve, the centre of which was nearest to the enemy. The French forces occupied a series of heights opposite the British, there being a valley of no great depth, and from 500 to 800 yards in breadth, between them. Napoleon had bivouacked about a mile from the British camp on the eminence of La Belle Alliance, near the centre of the position occupied by his army, which extended on both sides of the road from Charleroi to Brussels, this road also passing through the middle of the British lines. The French were drawn up in three lines, the infantry corps of Reille and Drouet with Piré's cavalry forming the first; the second consisting of cavalry, the third of the 6th army corps under Lobau, while behind all were the imperial guard in reserve. There were thus three corps of infantry, two of cavalry, and all the guards, amounting to about 75,000 men with 250 guns. The allied army amounted to about 70,000 men (of whom only 25,000 were British) with 150 guns. The troops of Napoleon were for the most part veterans, while Wellington had an army composed of troops of various nationalities that had never fought together, and a great part of his English troops were raw levies. Napoleon's design was to break the centre of the British, and cut off their retreat, but in all events to prevent them from joining the Prussians. The battle began about noon, June 18, by an attack of the second French battalion on the advanced post of Hougoumont. The wood round this post was taken by the French, but the house, garden, and farm-offices were maintained by the British guards during the whole day. About two o'clock four columns of French infantry under Ney advanced from La Belle Alliance against the British centre. The cavalry supported them, but were repulsed by the British cavalry, while the infantry, who had forced their way to the centre of the British position, were attacked by a brigade brought up from the second line by General Picton, while at the same time a brigade of heavy British cavalry charged them in flank. The French columns were broken with great slaughter, and more than 2000 men made prisoners. Soon after the French made themselves masters of the farm of La Haye Sainte. This was followed by repeated attacks on the allied centre and right, Ney hurling against the enemy Milhaud's cuirassiers, Kellermann's cuirassiers

and the light and heavy cavalry of the guard, but without success. The soldiers of Wellington held their ground, and though they suffered severely, the slaughter among their opponents was as great or greater. During the battle several French batteries were stationed only a few hundred paces in front of the British, and did great execution. Between four and five the van of the fourth Prussian battalion (which the French thought at first to be the corps of Grouchy), under the command of General Bülow, showed itself in front of the village of Planchenoit on the right flank and the rear of the enemy. The battalion had left Wavre the same morning, and, animated by the presence of Blücher, had overcome all the obstacles of the march. Planchenoit was taken, but the sixth French corps (Lobau's), strengthened by reinforcements from the guards, attacked the Prussians and forced them from the place. Napoleon, aware that Blücher was approaching with his troops, now resolved to make another desperate attack upon the centre of the allied forces, and for this purpose collected ten battalions of the old and middle guard, which made the attack in two successive columns, supported by flank attacks of other troops. Wellington having collected all the troops he could, quietly awaited the approach of the French, and as soon as the dense columns had arrived within a short distance he opened on them so murderous a fire that they fairly recoiled, being immediately assailed by the British and forced down the slope. A general movement of advance was now made on the allied side, and the sudden appearance of the first brigade of the first Prussian battalion under General Zieten decided the battle. Their arrival had been delayed by the badness of the roads. They immediately separated the sixth French corps from the rest of the army, and, by means of twenty-four cannon brought to bear on the rear of the enemy, put them to flight. At the same moment the British cavalry had overthrown and dispersed the infantry stationed at La Haye. These troops became mingled at La Belle Alliance with those who were pursued by the first Prussian corps; and thus their defeat became complete. The British and Prussians followed hotly, and kept up a continued fire. A portion of the guard held their ground with desperate firmness and were cut to pieces. The French were thrown into inextricable confusion. All the artillery and baggage were abandoned. At Belle Alliance the victorious generals met. Blücher now ordered a pursuit on the part of the Prussians with all the disposable troops. In Genappes, which was taken by a sudden attack, the travelling carriage of Napoleon, as well as many military chests, and the rest of the baggage of the French army, fell into the hands of the conquerors. The whole French army was dispersed and disabled. The loss in killed, wounded, and prisoners amounted to between 40,000 and 50,000. The allied loss amounted to 23,000 killed and wounded, of whom over 11,000 were British and Hanoverians, 3000 Netherlands, and 7000 Prussians. Napoleon hastened to Paris. Grouchy, however, returned through Namur, and brought his army with serious loss to Paris. The Prussians often speak of this victory by the name of La Belle Alliance; the French have called it Mont St. Jean, from the château of that name in rear of the allied troops.

**WATER-MITES** (*Hydrachnida*), a group of lower Arachnida, belonging to the order Acarina, and distinguished by having the head provided with two or four *ocelli* or simple eyes, and by possessing four pairs of hairy swimming legs. These mites appear to exist in their earlier life as parasites on water-insects, and to undergo a metamorphosis—the larva having six legs only. The Harlequin Mite (*Atas*

*Astrionotus*) is a familiar species, and forms a kind of web, which retains air for breathing under water. Another well-known genus is *Diploodontus*, the males and females being respectively sociable and living in swarms. *Limnochares aquaticus*, another genus and species, attaches itself to insects. The body is reddish and irregularly oval in shape, and the legs are furnished with claws. A species of this genus, *L. concharum*, is shown at ENTOMOLOGY, Pl. III., fig. 60.

WATER-OUSEL, or DIPPER. See DIPPER.

WATERPROOF CLOTH. There are several methods of rendering cloth waterproof. The first to be adopted was that which was patented by Macintosh in 1823, and which consists in covering the cloth (linen or cotton) with a thin layer of caoutchouc. This method has the inconvenience of rendering the cloth impervious to air as well as water, in consequence of which the continued wearing of a waterproof garment of that sort is apt to induce a disagreeably profuse perspiration. To obviate this disadvantage the following two methods have been resorted to for rendering woollen cloth waterproof. The first consists in dipping the cloth in a solution of soap which is rubbed well into its texture, and then passing it through a solution of alum. The other method consists in first dipping it in a solution of gelatine or isinglass, and then in a solution of galls. The gelatine or isinglass is rendered insoluble by the tannin of the galls. A third method has been recommended by Professor Balard. This is to steep the cloth for quarter of an hour in a mixture composed of a solution of acetate of lead in water, and another solution of sulphate of alumina.

WATER-SCORPION. See NEPA.

WATER-SPOUT. See WHIRLWINDS.

WATER-WHEEL. See HYDRAULICS.

WATFORD, a town in Hertfordshire, on the river Colne, the Grand Junction Canal, and the London and North-Western Railway. It is well built, and has an ancient parish church, restored in 1871; two handsome modern churches, schools, endowed public library, and school of science and art. The London Orphan Asylum is also situated here. In the town or vicinity are breweries, paper-mills, silk-mill, wood-turnery establishments, and a straw-plait manufactory. Pop. (1891), 16,819; (1901), 29,023.

WATLINGSTREET, one of the Roman military roads made in Britain while in possession of the Romans, running from Dover by St. Alban's (Verulamium), Dunstable (Forum Dianæ), Towcester (Lactodurum), Atterton, and Shrewsbury, and ending at Cardigan, in Wales.

WATT, JAMES, the celebrated improver of the steam-engine, was born at Greenock, January 19, 1736; and died at his seat of Heathfield, Staffordshire, August 25, 1819. His father was a respectable merchant and magistrate of Greenock, and James received a good education in its public schools. He had a delicate constitution, and very soon displayed the same love of retirement and study which was visible in all his after life. Having determined to adopt the trade of mathematical instrument maker, he spent a year in London learning the art, and not long after his return endeavoured to set himself up in business in Glasgow. In this he might not, perhaps, have succeeded, owing to the opposition of the Glasgow burghesses, had he not been appointed (1757) mathematical instrument maker to the university, which was outside of the jurisdiction of the Glasgow municipality. He had apartments given him in the college, where he remained till 1763, when he removed into the town. From this time till 1774 he acted as a civil engineer—made several surveys for canals and harbours, and some of his plans were afterwards carried into execution. It

was during this period that he thought of and completed most of his improvements of the steam-engine. The idea of a separate condenser first occurred to him early in 1765, and in January, 1769, he took out the patent for the improvements of the steam-engine in which this idea was applied. But it was not till the year 1774 that he united himself with Mr. Boulton, a great manufacturer at Birmingham, in order to carry his improvements into execution. In consequence of this he removed to Soho, near Birmingham, where the establishment in which his steam-engines were manufactured soon acquired a European fame. He retired from the business in 1800, when his patent, which had been renewed in 1775 for twenty-five years, expired. Watt was a fellow of the Royal Societies both of London and Edinburgh, and one of the few natives of Great Britain who have been elected members of the National Institute of France. He was twice married, and was survived by one son, who carried on the establishment at Soho, in partnership with a son of Mr. Boulton's. Besides improving the steam-engine Watt invented or improved a variety of other instruments. He had a powerful memory, and the range of his reading was very wide. Chemistry, architecture, music, law, metaphysics, and language were the principal subjects which, in addition to physical science and its practical applications, engaged his attention, and in all of them his knowledge was wonderfully extensive, minute, and accurate. Like most other ingenious men, he was exposed to considerable expense, trouble, and injury, by having his inventions pirated; but of this he never took any other notice than to protect his rights and the interest of his family and children, by having recourse to the laws of his country. Such was the influence of his mild character and perfect fairness and liberality, that all men of learning and science who were at all acquainted with him, loved him as a friend; even pretenders to these accomplishments were subdued by his plain sincerity, so that he disarmed envy itself. For an account of the improvements that Watt effected in the steam-engine see STEAM-ENGINE.

WATTEAU, JEAN ANTOINE, a painter of great merit, talents, and industry, born October 10, 1684, at Valenciennes; died at Nogent-sur-Marne, July 18, 1721. His parents, whose situation in life was very humble, with difficulty contrived to give him the instructions of a very inferior master in the country. In 1702 he went to Paris, in company with a scene-painter, with whom he continued to work for a few months. Soon after he found employment with one Claude Gillot, who, although only a painter of decorations for ballets, and a designer of costumes and of patterns for tapestry, was a true artist. With him he found an opportunity of practising in all these branches of art, and when he left him he found another master in Claude Audran, keeper of the Luxembourg, who was of great service to him in opening to him the famous gallery of the palace in which Rubens had painted in allegory the history of Marie de Médicis. He now began to paint on his own account, but met at first with little encouragement. But this did not last long and in the course of a few years he became popular and prosperous. In 1717 he was received at the Academy, and was enrolled in its register under the novel title of painter of *scènes galantes*. A year or two before his death he came over to England, in order, it is said, to consult a certain Dr. Meade regarding his health, which was never robust. He remained a year, and seems to have received more injury to his health from the English climate than benefit from the doctor's prescriptions. His favourite subjects were pleasure parties, balls, concerts, masquerades, &c.

**WATTS, ISAAC**, an English Nonconformist divine, eminently distinguished for his learning and piety, was born at Southampton in 1674, and was educated for the ministry at a Dissenting academy in London. In 1696 he became tutor to the son of Sir John Hartopp, at Stoke-Newington, near London, and in 1702 succeeded Dr. Isaac Chauncey (to whom he had previously been assistant) as minister of a Dissenting congregation in the metropolis. An attack of fever, in 1712, obliged him to relinquish for a time his pastoral duties, when he obtained an asylum at the house of Sir T. Abney, a London alderman, at Newington; and there he resided during the remainder of his life. He died Nov. 25, 1748. Among his works are *Lyric Poems*; *Psalms and Hymns*; *Sermons*; *Philosophical Essays*; a discourse on Education; an *Elementary Treatise on Astronomy and Geography*; a *Brief Scheme of Ontology*; *Logic*, and a valuable supplement to it entitled the *Improvement of the Mind*; besides theological tracts, and various controversial pieces.

**WAT TYLER.** See **POLL-TAX.**

**WAVES**, disturbances of matter in such a way that energy is transmitted through great distances while each particle of matter concerned moves to a small distance from its initial position. A good example of wave motion is when a pebble is dropped into a smooth pool; it is seen that rings of waves soon extend to the margin, but a floating chip or dry leaf merely rises and falls with the waves. A corn field when moved by the wind also illustrates wave motion; the heads of corn merely move up and down, while the waves appear to sweep along with the velocity of the wind. When a pebble is thrown into water the waves are seen at the surface, but they also exist downwards (the wave-front is of the shape of a shallow basin); the impulse is propagated in all directions from the point of disturbance as centre. When a disturbance is produced at a point in air, waves proceed from that point as concentric spheres and carry sound to the ear of a listener. Dr. Töpler has invented an apparatus which renders such air waves visible (Pogg. Ann. cxvii. pp. 556-580). Light is supposed to be propagated by the wave motion of a substance called ether in a manner somewhat analogous to the propagation of sound in air. A wave-length is the distance from a crest to the next crest or the distance travelled by the wave-front while a disturbed particle describes its complete path or orbit.

In the case of waves in the ocean produced by wind there is a slight motion of translation in the direction in which the wind is blowing. Ansted says 'the highest and largest waves do not often exceed 40 feet from the crest to the deepest part of the trough. The uninterrupted length of a wave of this magnitude is not very considerable. When these great waves approach the shore or shoal water and reach the bottom of the sea they increase in height, reaching sometimes to upwards of 150 feet, but they diminish in breadth or amplitude, and become pointed. Thus lifted up they often topple over, breaking with great violence into foam.' A tidal wave is the motion of high water to different parts of an ocean caused by the joint attractions of the moon and sun and modified by the forms of the different coasts and the shape of the ocean bed.

**WAVRE**, a town in Belgium, in the province of Brabant, on the Dyle, 15 miles south-east of Brussels; with manufactures of cotton, bricks, matches, candles, paper, leather; and a trade in corn, and more especially cattle. A sanguinary combat was fought here on the same day as the battle of Waterloo (June 18, 1815), between a Prussian corps under Thielmann and a French division under Grouchy. Pop. (1897), 7971.

**WAX** is a concrete, unctuous-feeling substance, which partakes of the nature of fixed oil. It is secreted by bees in constructing their hives, and is also a most abundant vegetable production, entering into the composition of the pollen of flowers, covering the envelope of the plum and of other fruits, especially of the berry of the *Myrica cerifera*, and, in many instances, forming a kind of varnish to the surface of leaves. It is distinguished from fat and resinous bodies by its not readily forming soaps when treated with alkaline solutions. Common wax is always more or less coloured, and has a distinct, peculiar odour, of both of which it may be deprived by exposure in thin slices to air, light, and moisture, or more speedily by the action of chlorine. At ordinary temperatures wax is solid and somewhat brittle; but it may be easily cut with a knife, and the fresh surface presents a characteristic appearance, to which the name of *waxy lustre* is applied. Its specific gravity is 0.96. At 155° Fahr. it enters into fusion, and boils at a high temperature. Heated to redness in a closed vessel it suffers decomposition, yielding products very similar to those which are procured under the same circumstances from oil. It is insoluble in water, and is only dissolved in small quantities by alcohol or ether. Wax appears to be a mixture of *myricin*, *cerotic acid*, and *cerolein*. The name *wax* is now applied to substances other than, but resembling bees'-wax; these substances are partly of animal, partly of vegetable origin. In bleaching wax the wax must be melted, with a degree of heat not sufficient to alter its quality, in a caldron so disposed that the melted wax may flow gradually through a pipe at the bottom of the caldron into a large wooden cylinder that turns continually round its axis, and upon which the melted wax falls. As the surface of this cylinder is always moistened with water, the wax falling upon it does not adhere to it, but quickly becomes solid and flat, and acquires the form of ribands. The continual rotation of the cylinder carries off these ribands as fast as they are formed, and distributes them through the tub. When all the wax now to be whitened is thus formed, it is to be put upon large frames covered with linen cloth, which are supported about a foot and a half above the ground in a situation exposed to the air, the dew, and the sun. If the weather be favourable, the colour will be nearly discharged in a few days. It is then to be remelted and formed into ribands, and exposed to the action of the air as before. These operations are to be repeated till the wax is rendered perfectly white, when it is cast into cakes or moulded into candles.

The principal applications of wax are to make candles and medicinal cerates; to give a polish to furniture or floors, for which purpose it is largely used in Southern Europe; to form a lute or cement, for which it is used by chemists; and to serve as a vehicle for colours. For an account of the method in which it was used for the last purpose by the ancients see **ENCAUSTIC PAINTING**. By modern painters colours previously prepared in oil are sometimes diluted just before being laid on in a mixture of wax and oil of turpentine. This practice is much resorted to by French artists, especially in mural paintings. The object of it is to keep the painting free from that lustrous appearance which often renders it difficult to be seen properly in consequence of reflection. Wax also forms a principal ingredient in modellers' wax and gilders' wax. In the former the other ingredients are druggists' lead-plaster, olive oil, yellow resin, and whiting; and in the latter verdigris and sulphate of copper. Sealing-wax is not properly a wax at all, but is composed of resin lac and some less brittle resin. The largest consump-

tion of wax takes place in Catholic countries, where large quantities are required for the candles used in religious ceremonies. The total amount of wax imported into Britain in 1901 was 40,114 cwts., valued at £158,748. The largest amount came from Germany, the United States, and Brazil.

WAX, SEALING. See SEAL and WAX.

WAX-MYRTLE. See CANDLEBERRY.

WAX-PAINTING. See ENCAUSTIC PAINTING and WAX.

WAX-PALM (*Ceroxylon andicola*), a species of palm yielding a substance somewhat resembling wax. It is a native of the Andes, towering in majestic beauty on mountains which rise many thousand feet above the level of the sea, approaching even to the verge of perpetual snow. Humboldt describes the tree as attaining the height of 180 feet, while it differs from all the other species of palms in flourishing in a much colder temperature. Its trunk is covered with a peculiar kind of varnish, possessing some of the properties of wax. Vauquelin subjected this product to chemical analysis, and found that it contained two-thirds of resin and one-third of wax.

WAX-WING (*Ampelis garrula*), an Insectorial Bird belonging to the sub-family *Ampelinae* of the Dentirostral section of the order. This genus is distinguished by the moderate size of the bill, the nostrils being lateral and concealed by feathers. The wings have their second quills longest. The claws are short and curved. This and allied birds derive the term 'Wax-wing' from the appendages attached to the secondary and tertiary quill-feathers of the wings, and which give to the birds the appearance of having spots of red sealing-wax scattered thereupon. The Bohemian Chatterer or Common Wax-wing above denoted, is a familiar example of this group. It is found in tolerable plenty in England, but is not a very common bird. The exact *habitat* of these birds is believed to be North Europe; but other opinions agree in stating Central Asia to be its home. The colour is a grayish-brown, variously marked with brown tints. In all about eight of the waxy-looking appendages exist on the wings and tail, these structures being developed in the second year. The food consists of berries. These birds are eaten in Norway, and their flesh is esteemed in other northern countries. See PL. II., fig. 21, at ORNITHOLOGY.

WAYS AND MEANS, COMMITTEE OF. See SUPPLY (COMMITTEE OF).

WEALDEN FORMATION. See GEOLOGY.

WEANING (of the child from its mother's breast). The age of twelve months, when the cutting of the first teeth has taken place, may be regarded as about the proper period for weaning. With children who are healthy, and cut their teeth early, it may take place still sooner; with weak, sickly children, it must be delayed longer, and never should be attempted during sickness or dentition. It is best for both mother and child to bring it about gradually. By so doing the secretion of milk in the former is gradually diminished, and those complaints which arise from sudden weaning are prevented; while the child is gradually accustomed to other kinds of sustenance, and the restlessness and want of sleep, which are so troublesome in sudden weaning, are avoided. Both during the weaning and some time after it, no food should be given to the child except what is very light of digestion, and more fluid than solid, and in particular what has no stimulating qualities, nor any that will tend to create acidity, or produce other marked changes in the organic functions.

WEAPONS. See ARMS.

WEAR, or VEEB. See SHIP.

WEARMOUTH, BISHOP'S, and MONK WEARMOUTH. See SUNDERLAND.

WEASEL (*Mustela vulgaris*), a species of Carnivorous Mammals, belonging to the semi-plagiate division of the order, and forming a typical example of the family Mustelidae. In this family, which also includes the Skunks, Badgers, Gluttons, and other animals, the body is elongated, the head is long, the legs short, and the muzzle rounded. The feet have each five toes. In the genus *Mustela* the premolar teeth number eight in each jaw. In many Mustelids anal glands are developed, these glands secreting a strong-smelling substance, which is especially offensive in the Skunks (which see). The weasel is a well-known British quadruped, attaining a length of from 10 to 12 inches, and exhibiting a bright brown colour on the upper parts, the under parts being white. The tail is tinted uniformly with the body. The weasel is a highly courageous animal, and makes war on rats, mice, hares and rabbits, birds, and many other animals. Many instances are on record in which these animals have spontaneously attacked horses and cows, and they seem nearly at all times to exhibit an utter indifference to the proximity of man. They are especially fond of eggs, and rob nests and hen-roosts. Their mode of killing their prey is characteristic—since they usually fasten on to the neck of their victim, and hold firmly on whilst they suck the blood. The fur appears to change colour in winter, and, like its northern allies, the weasel may appear clad in a fur of a uniform white colour. See PL. II., fig. 17, at CARNIVORA.

WEATHER. See METEOROLOGY.

WEAVER-BIRD, the name given to various genera of Insectorial birds, belonging to the Conirostral section of the order, and to the family of the Fringillidae or Finches. These birds are so named from their habit of weaving together various materials to form their nests. They inhabit the warmer regions of the Old World, being chiefly found in Africa and India. Of this group of birds the *Phileterus socius*, or Sociable weaver-bird, is a good example. In this genus the bill is compressed and arched above; the wings have the first quill abortive, and the second to the fourth longest. This bird occurs in South Africa. Its length is about 5 inches; and its colour is brown, paler on the under parts, and marked with light tints above. The nest is built of long grasses, and a general roof or shelter is constructed, beneath which several nests are built. Each nest opens below; and the site selected for the nests, on the lighter branches of trees, is calculated to defy the attacks of snakes and monkeys alike. The eggs number three to five, and are coloured bluish-white. Another social weaver-bird is that known as the 'Mahali' species. This bird attains a length of 6 or 7 inches, and is coloured brown, variegated with yellowish-white. The Taha Weaver (*Ploceus Taha*), also inhabiting Africa, appears to frequent rivers. The colour of the male is yellowish-brown, black, and gray. In this genus the nostrils are partly concealed by plumes. The Red-necked Weaver (*Hyphantornis textor*) is found in Congo and Senegal, and is distinguished by the red band encircling the black neck. The head is also black, and the other parts are coloured of an orange-yellow. The length is about 6 inches. These birds are often brought to Europe as cage-birds, and when furnished with a few cotton threads will entwine them in a skilful and ingenious manner between the wires of their cage by aid of their bills. This genus has the keel or ridge of the bill pointed on the forehead. The wings have their fourth quills longest, and the tail is short and even. The genus *Textor*, exemplified by the Red-billed Weaver (*T. erythrorhynchus*), is perhaps as illustrative a group of these birds as any. This genus is distinguished by the bill being broad at its base and curved towards its



tip, with wavy edges. The nostrils are pierced in the bill. The toes are short and the nails curved. The Red-billed species is common in South Africa. Its colour is a very dark brown above, and reddish-brown below. The chin and ears are black, the bill being crimson. This bird is a great favourite with dealers, and can be bred in Europe like the canary. It appears, like certain other birds, to pick insect-larvæ out of the buffaloes' hides in its native country.

**WEAVER'S-SHUTTLE SHELL** (*Ovulum volva*), a species of Gasteropodous Mollusca, belonging to the Cowry family (Cypræidæ), and so named from its elongated shape, which is extended by the canal at each extremity of the shell being greatly produced.

**WEAVING**, the art of producing cloth by the combination of flexible fibres, is one of very remote antiquity, and in its primitive forms would seem to be almost co-existent with the first development of the constructive and inventive powers of man. The frame or apparatus on which cloth is woven is termed a *loom*. Among all barbarous nations weaving consists of warping and crossing grasses and such simple materials as are most easily obtainable. This is weaving in its most primitive state, and is purely darning. The long threads running from end to end of the piece are called the warp. The cross ones interlacing from side to side, the weft. Cloth may be wrought in this way, but it must be at an immense cost of time. In the method of weaving by darning every alternate thread of the warp must be lifted by itself to put in the weft-shot, and the process is therefore very tedious. If, however, a method were invented for lifting up a certain portion of the warp at once, which is called shedding the web, to receive the weft shot, this would be a great saving of time, and this is weaving in its second stage. Weaving in this state exists among all partially civilized nations. Among the Egyptians, East Indians, Chinese, and others, weaving has existed in this state from time immemorial. These countries are admirably situated for carrying on the manufacture. They have abundance of the best material for the purpose. The silk of China, the cotton of India, the flax of Egypt, and the wool of Asia Minor, afford inexhaustible and beautiful materials for the manufacture of cloth. Hence they have been distinguished for the weaving of various fabrics from a very early period. The writers of the Old Testament make frequent mention of the fine linen of Egypt and the purple of Tyre. Herodotus, the oldest of the Greek historians, who lived in the fifth century B.C., informs us that cotton cloth was the common dress of the inhabitants of India. He says, in speaking of this people, that 'they possess likewise a kind of plant, which, instead of fruit, produces wool of a finer quality than that of sheep; of this the natives make their clothes.' The fine figured fabrics, especially the silks of China, were bought by the Greeks and Romans at extravagant prices, even for their weight in gold.

The great improvements in weaving all belong to the last 150 years. In the Philosophical Transactions of the year 1678 a description is given of 'a new engine', invented by one M. De Gennes, 'to make linen cloth without the aid of an artificer'. In this machine it was proposed to utilize water-power for that purpose, but it does not appear that the machine ever came into use. The success of Arkwright in the application of power to spinning in the latter part of the 18th century turned the attention of inventors to the question whether it was not possible to do the like for weaving. The earliest attempts to solve this problem were those of Dr. Cartwright, who in 1785 patented a machine which, though not altogether successful in accomplishing what it was in-

tended to, has been found capable of improvement to such an extent as to enable it almost entirely to supersede the hand-loom. The first power-loom actually in use for weaving cotton fabrics was one set up by a Mr. Austin in a factory near Glasgow in 1798. At first there was a great obstacle to the success of power-loom weaving in the necessity of frequently stopping the loom to dress the warp as it unwound from the beam. This obstacle was overcome by the invention, about the beginning of the nineteenth century, of the dressing-machine for dressing the warp before it goes into the loom, an invention due to a Mr. Radcliffe, aided by a workman named Thomas Johnson. This machine is now superseded by the beam-warping and slasher-sizing machines. For a notice of some of the other improvements in the machinery applied to weaving the reader is referred to the following account of the processes of that art.

There are certain operations preliminary to weaving which yarn after it is spun must undergo before it is ready for the weaving-machine. These are warping, beaming, and sizing, of all of which mention is made in the article BEAMING. In that article it is mentioned that in power-weaving the operations of warping and beaming are performed on one machine, after which the sizing is performed on another machine in which also the warp of several beams is wound upon one. This machine is called the slasher-sizing machine, and the accompanying Pl. I. shows an elevation and a plan of it. The beams taken from the beam-warping machine are placed at that part of this machine which is seen at the right hand of the plate. From these beams the yarn is unwound, and passes through a vessel containing boiling size, then round two large copper cylinders heated by steam by which the yarn is dried, and finally is wound round another beam at the other end of the machine.

Weaving is performed upon a *loom*, which is merely a frame for the purpose of stretching out the warp or web that is to be made into cloth. The web, which is of any convenient length, is kept stretched between two parallel beams, fixed horizontally between upright standards. The one beam, on which the warp is wound, is called the yarn roll, and is that which results from the operation of beaming, and the other, on which the cloth is wound, the cloth beam or roll. The latter is near the front part of the frame, or the part where, in the common hand-loom, the weaver sits. Between the two beams, about 15 inches from the cloth beam, is an apparatus for the purpose of shedding the web, or opening the threads of the warp for the weaver to throw in the shuttle and interlace the weft. This apparatus is called the heddles, and consists of two frames with cords stretched upon them hanging vertically from a horizontal beam, in such a manner that either can be raised or let down by means of a treadle. There is a cord or single heddle for each thread in the warp, and the thread is taken through a loop or eye in the middle of the heddle. Every second thread is passed through the loops of one leaf of the heddles, and the remainder through the other leaf. Consequently, when one heddle is raised every alternate thread of the warp is raised with it, and the warp is said to be shed. The weft-shot is introduced or carried through the shed by an instrument called the shuttle. This is a kind of wooden carriage, tapering at each end. It is hollowed out in the middle for the reception of the weft, which is wound on a bit of turned wood called a *pirn* or *bobbin*. The weft unwinds from this pirn as the shuttle runs from the one side of the web to the other. The shuttle is driven across by receiving a smart blow from a wooden pin called a *picker* (in some parts of Scotland driver). There is



one of these pins on each side of the loom, and they are connected by a cord to which is attached a handle. Holding this handle in his right hand, the weaver moves the two pins together in each direction alternately by a sudden jerk. A shuttle propelled in this manner is called a fly-shuttle, and is the invention of one John Kay, a mechanic of Colchester, afterwards of Bury in Lancashire, who invented it in 1738. Before that invention the weaver took the shuttle between the finger and thumb of each hand alternately, and threw it across, by which much time was lost in the operation. After the weft-shot has been introduced, the next thing is to drive it home. This is done by what is called the reed, which is like a fine comb formed of flattened pieces of fine wire or slips of cane, called *dents*. There is a dent between every two threads of the warp, and to give effect or strength to the reed to drive home the shot with any required force, it is fastened in a frame called the *lay*, *lathe*, or *batten*. The lay vibrates like a pendulum, and the weaver having formed the shed, and driven the shuttle through it to the other side of the web, then rapidly brings the lay forward to the verge of the cloth, or fell, and strikes home the shot.

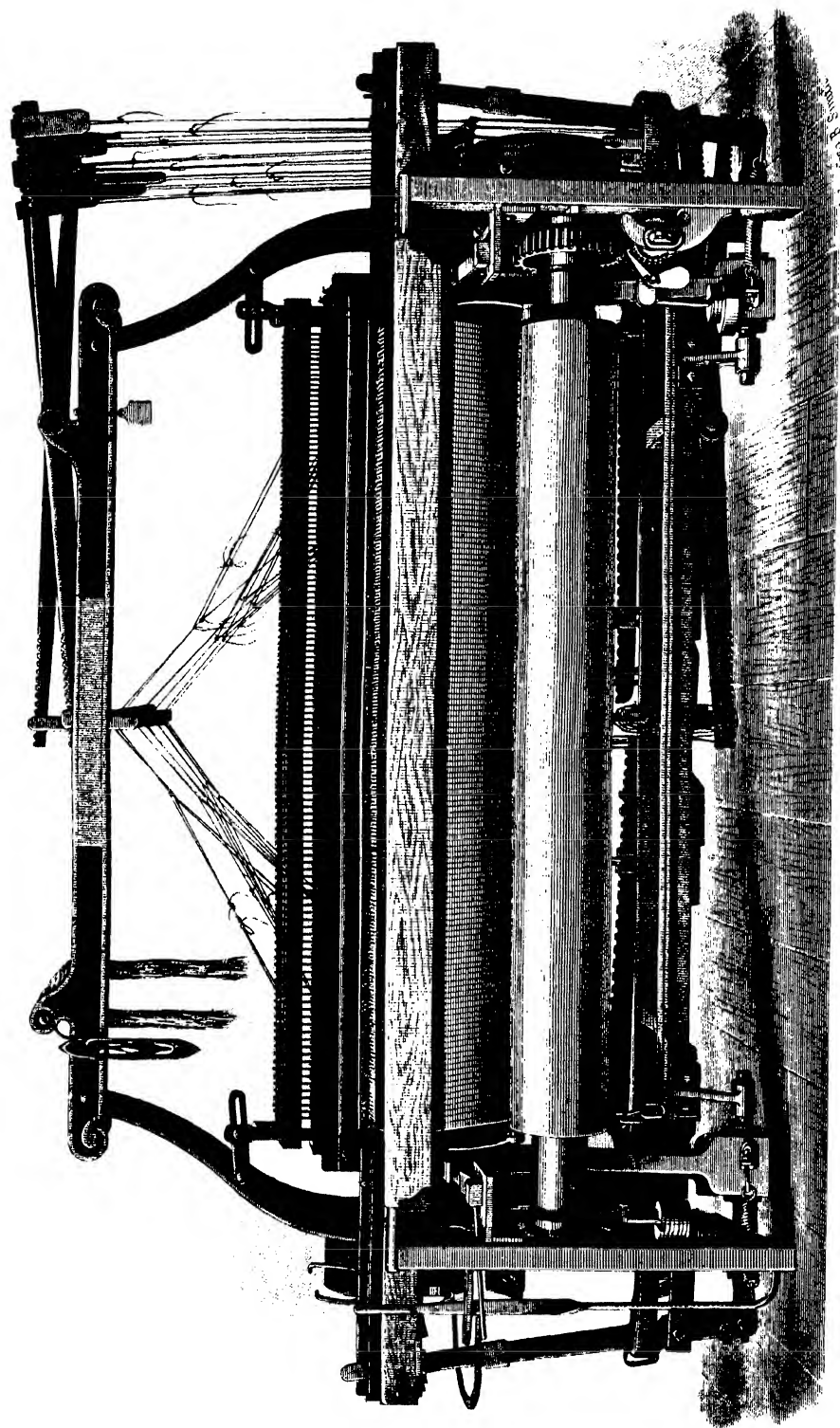
With the exception of Kay's invention, and improvements in the adaptations of those parts of the loom which move the warp for the purpose of forming various kinds of ornamental figures on the woven cloth, no great change took place in the form of looms till 1785, when Edmund Cartwright brought his first power-loom into action. Since that time the progress made in developing and perfecting the loom has been simply wonderful; the automatic looms of the present day apparently leaving little to accomplish in the way of improvement, except it be to dispense with human superintendence altogether. The capability of the modern power-loom is extraordinary: connected with motive power, and supplied with the properly adjusted warp and weft, it goes on fabricating textures of every kind from the plainest calico to figured cloths of the most gorgeous designs. Fabrics other than plain cloths necessitate the use of various attachments, such as twilling-motions, Jacquard apparatus, &c., the latter of which can produce patterns in a practically illimitable variety. In power-looms five distinct actions are performed: (1) raising and lowering alternately the two sets of warp-threads, (2) throwing the shuttle through the shedding of the warp-threads, (3) driving up the threads of the weft after the shuttle is thrown, (4) unwinding the warp from the beam, and (5) winding the cloth on the beams in front of the loom. These different motions are produced by a driving shaft which derives its power through a band from the common shaft directly impelled by the engine, and are performed with the most perfect regularity, thus ensuring thorough uniformity in the structure of the fabric, while at the same time a speed of from 200 to 400 shots per minute can be attained. An arrangement is also introduced into most looms for stopping when the shuttle sticks, when a thread breaks, or when the yarn in the shuttle has run out. This arrangement is effected in various ways according to the nature of the machine. For plain work, such as book muslins, printing cloths and other light fabrics, the loom known as Todd's patent, shown on Pl. II., is remarkable for simplicity and efficiency. It has the great advantages of lightness of construction and general openness of structure, thus allowing easy access to all its parts, while it is also easily kept in what is technically known as 'furnishings'. It differs in construction from other plain looms chiefly in two points, first in shedding mechanism, that is, the mechanism employed in opening up the warp to allow

the shuttle to pass through every alternate thread; and second, in picking mechanism, that is the mechanism employed to propel the shuttle itself across or through the warp. For the purposes of 'shedding' the inventor dispenses with the usual treddles and wipers, and instead uses a roller shaft *e* which runs parallel to the driving shaft, and has a rocking motion turning half round in one direction towards the front of the loom and then half round in the opposite direction, thus giving the requisite up and down motion through strap *b* to the heddles *c* which are supported by roller *d*. This is accomplished by an arrangement of two half-moon shaped wheels and lever which connects the shaft with another which is geared to the driving-shaft *e* and runs at half the speed of the latter. The lay *f* of this machine, like most other power-looms, rocks on an under bar and does not swing with the pendulum motion of the hand-loom lay; the reed, shuttle-raise, &c., is consequently on the top, while the swords of the lay connect the upper parts with the rocking-bar below. The 'picking' mechanism, or the arrangement for propelling the shuttle from one side to the other through the shedding, which is one of the distinguishing peculiarities of the 'Todd' loom, is partly connected with the lay and partly with the rolling shaft *a* described above. The shaft *a* as it rocks backward and forward raises and lowers alternately two pins in slots at each side of the loom. These pins come smartly in contact with two similar pins fixed in a shaft attached to the sword of the lay *g* as it moves backward, and, changing the motion, communicate an impact to the picking-stick *h* by means of the leather strap *i* and through it to the picker in the shuttle-box *k*. This movement takes place alternately right and left, and so propels the shuttle from side to side with wonderful speed and regularity. A spring and strap is used for bringing back the picking-stick to its position after each shot, while the buffer-strap *m* softens the blow of the picking-stick and keeps it from wearing. In this loom the pickers have no spindles, hence the cloth is kept free from the stains of the oil which has to be used on looms where the pickers run on spindles. The end of the warp-beam is seen at *n*; *o* a weighting lever used to keep the warp in the proper degree of tension; *p* is reed fixed in shell *q*. The cloth-beam *r* receives the cloth from sand-beam *s* after it is woven: these beams are regulated by the toothed wheels *t* which are actuated by the lever *u*. The handle for starting the loom is seen at *v*. The capability of the plain loom is much increased by the introduction of special motions, such as the four-leaf-twill motion, and the 'tarlatan' motion, which, by means of a pattern cylinder, stops the shed as required in order to allow a number of shots to be thrown in so as to form a kind of cord.

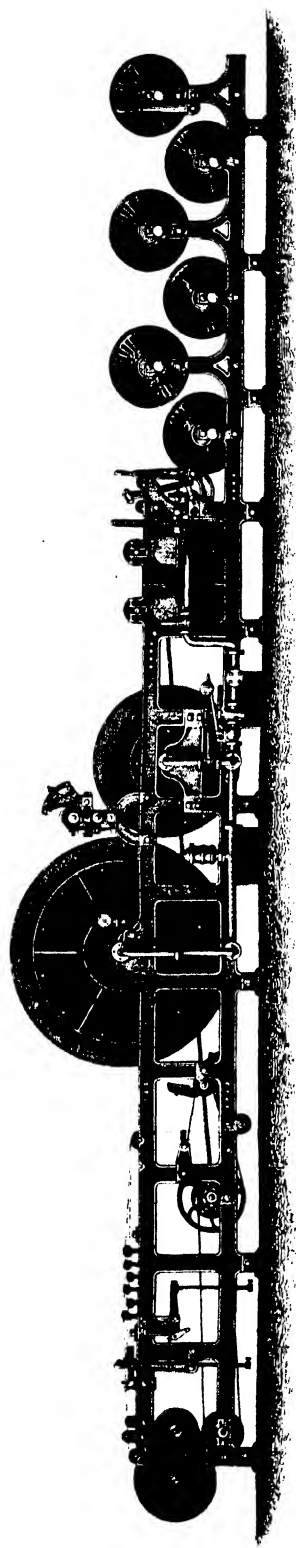
When the colour of the yarn in warp and weft is the same, and the arrangements are such as we have hitherto described, the process is called plain weaving, and the result is a fabric of uniform colour, and in which the warp and weft threads regularly interlace, every warp yarn passing above and below every second weft yarn, and every weft yarn above and below every second warp yarn. Pattern weaving consists either in using different colours in warp or weft or both, or in weaving with a more complicated mechanism than that already described, or in combining both variations. Without a more complicated mechanism only the simplest patterns can be wrought, namely, striped patterns, and what is called a shot pattern, in which a warp of one colour is interwoven with a weft of a uniform but different colour. Longitudinal stripes, or stripes running in the direction of the warp, are produced by making warp yarns



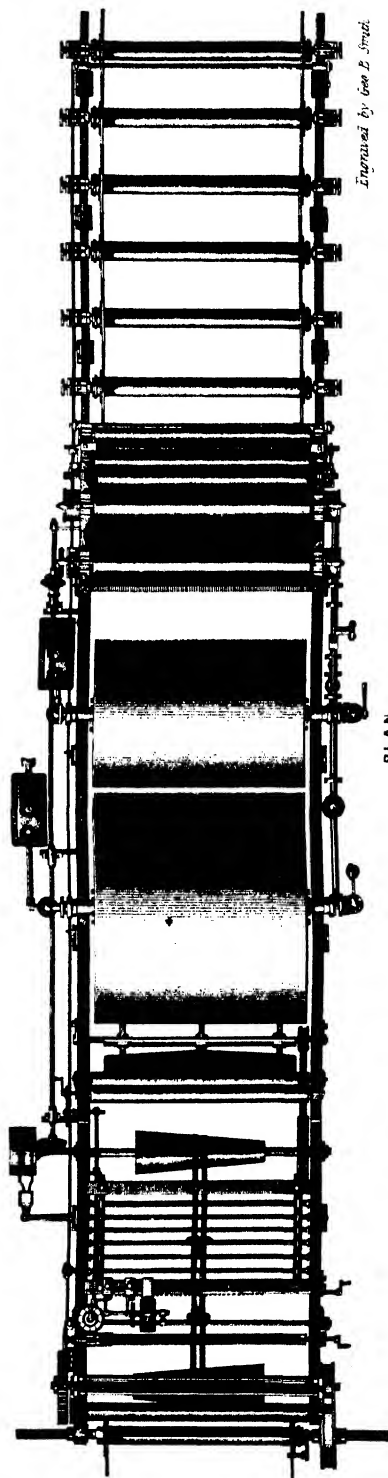
FUSTIAN LOOM  
BY W<sup>o</sup> SMITH & BROTHERS, HEYWOOD, MANCHESTER.



IMPROVED SLASHER SIZING MACHINE  
BY HACKING & CO., BURY.



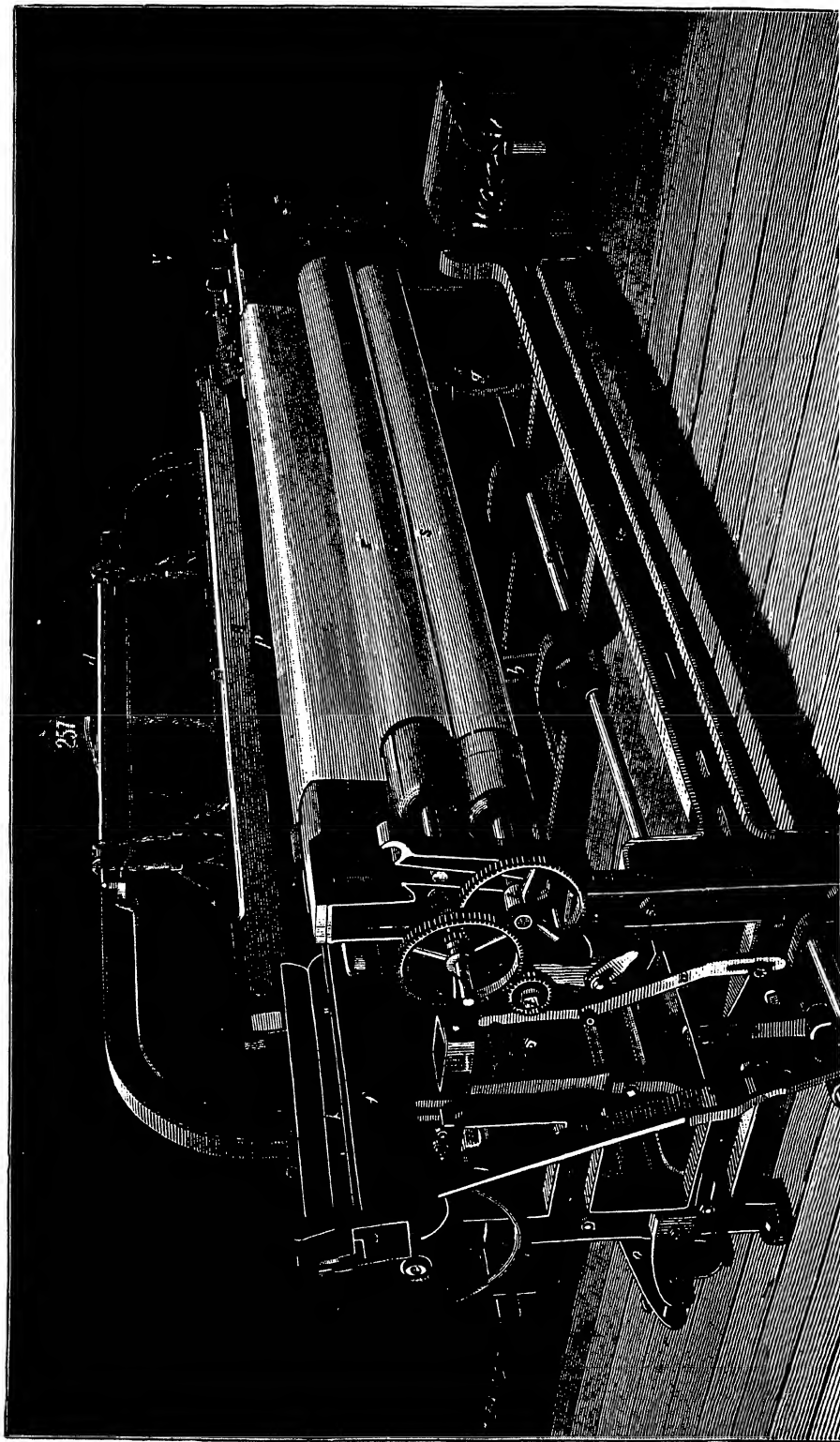
ELEVATION



PLAN

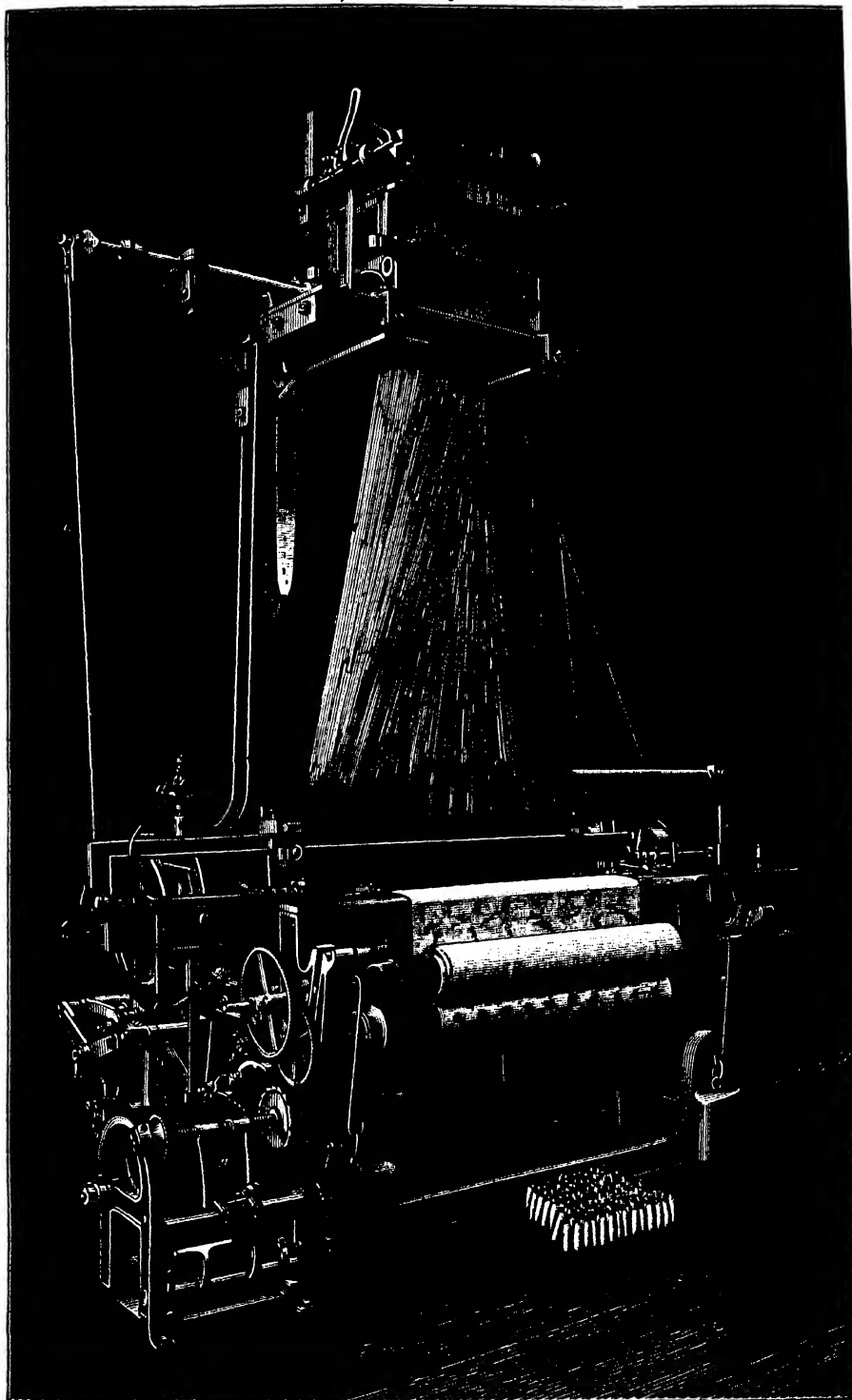
*Designed by Geo. E. Smith.*

POWER-LOOM—TODD'S PATENT.



WEAVING.

CHECK-LOOM, WITH JACQUARD ATTACHMENT.







of one colour alternate with others of another colour. Transverse stripes cannot be produced without an additional shuttle containing a differently coloured weft yarn. Longitudinal and transverse stripes may be combined in any manner the weaver may desire. When only two colours are used, and the same number of yarns of each colour are made to alternate with one another in warp and weft, a regular check is produced—that is, a pattern consisting of squares. It is evident that when only two colours are used one of the stripes in a striped pattern must always be pure or self-coloured and the other mixed or shot; and in a check pattern self-coloured squares of one colour will alternate with shot squares, and in the next line self-coloured squares of the other colour with shot squares. An ingenious contrivance for facilitating working with different shuttles was invented by Robert Kay, a son of the inventor of the fly-shuttle. The shuttles travel each from its own compartment in a box on one side of the loom to its own compartment in a box on the other side. The compartments lie one above the other; the boxes are movable vertically; and there is a simple mechanism to bring each shuttle when required to the plane on which it is to travel. Fancy weaving is another very extensive and distinct branch, and was until recently almost wholly wrought by hand. It consists of the interlacing of the warp and the weft in such a way as to produce a flower or figure. This figure can only be produced in weaving by two ways—by relieving the warp from the weft, and by contrasting colours and shading. Contrasting and shading can be carried to any extent in weaving; but relieving can be done only to the extent of the thickness of the thread. The weft may be thrown almost altogether on the one side and the warp nearly altogether on the other. This is done by twilling; and this kind of weaving is, properly speaking, the ground of fancy work. The shed of plain weaving is always one thread up and one down all over; but in twilling there is one thread out of 4, 5, 6, 7, 8, 9, 10, or any other number up, and the rest down. It is obvious that if the same threads and groups of threads were raised or depressed each time this could be effected with no other mechanism than is required for plain weaving; but in that case there would be no weaving at all in the proper sense of the term. To make a web of twilled cloth the shot thread must be made to pass over or under a different group of threads each time, and every thread of the warp must be raised singly in turn. To effect this there must be an additional leaf of heddles and an additional treadle to work it for every additional thread of warp that is to appear on one side of the web—that is, three leaves of heddles for two warp threads together; four for three warp threads together; and so on. When, for example, one thread is to be raised out of four, one leaf of heddles will be required to raise threads 1, 5, 9, 13, and so on; another to raise 2, 6, 10, 14, &c.; a third to raise 3, 7, 11, 15, &c.; and a fourth to raise 4, 8, 12, 16, &c. A power-loom for weaving fustian, which is a twilled fabric, is shown in the first plate. At the right hand of the machine at the top, are to be seen the levers for raising and lowering the different leaves of heddles. Twilling with a warp and weft of the same colour has only the effect of producing a cloth smooth on one surface and diagonally ribbed on the other. When the warp and weft are of different colours, say black and white, then one surface will appear black with diagonal white streaks and the other white with diagonal black streaks.

To work a figured pattern on the cloth the apparatus required is still more complicated. In this case, where the warp and the weft are of different colours, the pattern is formed by contrasting and relieving. The

oldest invention for effecting this object is called the draw-loom, in which the shed is partly formed by heddles and partly by an apparatus called the harness. The harness is exclusively used for forming the pattern, and is an ingenious arrangement of cords, whereby a different set of threads is raised for every shot of weft according to the pattern for which the arrangement is made. When this beautiful and ingenious invention was originated is not known, but it has undergone very great improvement since the quickening and extension of the trade by machinery. The harness is so arranged on a framing called the carriage that an assistant, usually a little boy, standing at the side of the loom, can draw the cords and thereby raise the yarn. The arranging of the cords for a particular pattern is a very laborious operation, sometimes occupying a man for three or four months continuously. When the weaver has got all this done, and the lathe on, the loom is mounted, and if he has got the yarn dressed all is ready for work. He then sets himself on the front of the loom, with his feet immediately above the treadles, and commences weaving by treading the first treadle with the right foot, which raises the shed; he moves the lathe back with his left hand, and seizes the picking pin to throw the shuttle with his right. The boy then draws the first lash, and the weaver throws the shuttle through the shed, and goes over the treadles, working four, six, or eight shots, according to the design, before the boy changes the lash. He has then wrought the little squares of the first line in the pattern. The boy then drops the cords, which are caused to fall quickly by the piece of lead wire suspended from each mail. He instantly raises the next lash, and this he does so quickly that the weaver does not require to stop the process of shuttling. The harness shed here raises the warp in stripes; and if the weaver throw in the shuttle without raising the heddle shed the shot would be floating from the one stripe to the other, wholly unattached to the warp. The heddle shed, therefore, by raising one-eighth of the warp, and at the same time by the sinking leaf depressing one-eighth part of that raised by the harness in succession, thus binds the whole together, but throwing the weft chiefly on the upper side of the web.

This is damask weaving, the principle on which table linen is wrought, and a great many shawls, chiefly for the foreign market. When the fabric is well made it is both very durable and very pretty. Both of the sides of this kind of cloth may be said to be right. The figure is on the one side and its counterpart on the other. Damask weaving, however, although forming the basis of all harness work, is in itself very defective in expression. It cannot portray a rich inflorescence. Whatever is the colour of the weft it is all incorporated more or less in the ground; it therefore suffuses colour, and from its defectiveness in shading and deepening it can do little more than exhibit a bare outline.

This defect in shading is indeed inseparable from the principle of damask weaving, where the weft, whatever may be the number of colours used, is all interwoven with the warp. But if instead of this arrangement we have two kinds of shots, one exclusively used for the spotting on the pattern and the other for the ground, which is merely for the purpose of keeping the spotting shots in their places, we have the principle of full harness weaving, on which all rich and extensive patterns are wrought; and this principle gives us inexhaustible resources for pictorial effect. The ground in this case, therefore, is a kind of texture or net-work, between the meshes of which the spotting shots are thrown in to form the pattern; and in the interstices between the pattern where they

are not needed for this purpose they float on the surface of the cloth, and are cut off after the piece comes from the weaver. In weaving this sort of work the weaver commences by throwing in a ground shot on the twill, and when this is done the boy draws the lash for the spotting shot. This shot is then thrown, and the lash for the next spotting shot of another colour is raised and thrown in like manner, and so on for as many spotting shots as may be used in the pattern, when the weaver closes them all in with a ground shot. In this kind of weaving, therefore, the spotting shots, however numerous, add nothing to the length of the piece; they merely increase the thickness and colouring of the pattern; and hence the value of the shawl, as a piece of work, depends on the number of spotting shots between each ground one. Those spotting shots that are used continuously over the whole pattern are called *covers*, but when used intermittingly or partially they are but parts of covers. As the weaver is paid so much per cover, and in proportion for a part, and as the material used is likewise in proportion to the number of covers, the manufacturer who is a severe economist endeavours to give effect with as few covers as possible. This is always more or less evident in cheap shawls.

The chief inconvenience in the weaving of shawls arises from the dependence of the weaver on the draw-boy. He is wholly incapable of proceeding without him, and as much of his success depends on the ability and management of the boy, he is frequently a source of great uneasiness to the weaver. An invention, therefore, to enable him to draw the harness shed by the process of weaving, and thereby dispense with the boy, was much wanted, and eagerly sought after. Various methods for this purpose were invented and tried by the trade, but were attended with little success till the introduction of the French or Jacquard loom, so called from the inventor, a native of Lyons. The invention belongs to the beginning of the nineteenth century, but its introduction into general use both in France and England was slow.

The inventors of all the plans that were previously tried to supersede the boy endeavoured to adapt their contrivances to the loom just as they found it, with all the details fitting it for manual operation. It could not, therefore, be otherwise than complicated and expensive, circumscribed and limited in its application. M. Jacquard, in full mastery of his subject, swept away all the details that were added merely to enable the boy to act upon the harness. What he wanted was to raise any given number of the cords by the weaver's treadle, with the least possible inconvenience in weaving, and we shall see how well he accomplishes his object. On the top of the loom, above the harness, is fixed a framing, having at its under part a board pierced with eight rows of holes, fifty-one in a row. Through these holes, attached to eyes on the ends of an equal number of perpendicular hooks, short cords descend, to which are tied all the cords of the harness, the eyes of the hooks resting on the holes. The hooks pass upward through eyes in as many needles placed in eight horizontal rows one above another, the eyes allowing the hooks a small backward-and-forward motion. One end of each needle is caused to protrude through the side of the frame by a spiral spring, on which its other end rests, consequently carrying the hook with which it is connected in that direction. Above this is a movable frame, in which are placed, horizontally and at right angles to the needles, eight flat iron bars, corresponding with the eight rows of hooks, which are slightly pressed against the bars by means of the springs acting on

the horizontal needles, the curved part of the hooks being just above the bar ready to be lifted by it when the frame is raised. The flat sides of these bars are made to incline a little out of the perpendicular toward the hooks, those which are to be raised being thereby caught with more certainty by the bars on their ascent, and when the frame descends the tops of those hooks which were not raised are pushed back by coming into contact with the inclined side of the bars, and by this means getting into their original position above them, in readiness to be lifted if required. It will be thus perceived, that as each hook passes through an eye in one of the horizontal needles, if any of their protruded ends were pushed back the hook connected with each would be carried along with it out of the way of the bar, and if the lifting-frame was now raised none of those pushed back would be taken up by it. In order to raise any required number of those hooks with the cords and warp attached to them, the following apparatus is employed: a four-sided roller or barrel is suspended in a swinging frame, exactly opposite the ends of the needles, and having each of its four sides perforated with holes answering to them in number and position, and into the perforations in which their ends would enter if the roller was applied to them, thereby allowing the hooks in connection with them to remain unmoved. An endless band of cards is made to revolve over this roller, each being exactly equal in size to one of its sides. These cards are pierced with holes opposite the needles connected with the hooks wanted to be raised, and when the roller with the card on its face is pressed to their ends they pass through the holes in the card into the perforations in the roller, and are raised on the elevation of the frame carrying the lifting-bars; the rest of the needles, being prevented by the card from entering the roller, are pushed back, carrying the hooks out of the way of the bars. The next motion causes a quarter of a revolution of the roller, and presents another card to the ends of the needles; and so on until all the cards have revolved, which completes the pattern, and which goes on to be repeated by the further working of the loom. The Jacquard was first applied to the hand-loom, where the various motions of the machine were all produced by the action of the weaver's foot on one treadle, which communicated with levers connected to its moving parts, causing a vibratory and rotatory motion of the roller, a revolving of the cards, and the raising of the movable frame with the lifting-bars; it is now most extensively used with power-looms. When designs are of a very elaborate character, many thousands of cards have to be used, instances occurring when they have exceeded 30,000 in number. Several methods have consequently been suggested or adopted to dispense with such a costly and cumbersome part of the machine, one of the most obvious improvements of this kind consisting in the employment of a roll of paper, or a series of very thin pasteboard cards punched with very small holes into which the fine needles of a secondary apparatus fit; this apparatus is attached to the front of the ordinary Jacquard in place of the wooden cylinder. A valuable improvement obviates the necessity of having to change the set of cards in use when weaving goods having end borders or figured centres or both. In the ordinary way a sufficient number of cards would require to be used to work the design right through; but it is usual to employ one set of cards for the centre figure or border or both, and another set for the ground and end border, changing the cards when required. This entailed a considerable loss of time, and the improvement referred to enables the weaver to effect the change almost im-

mediately. To the ordinary Jacquard with which the loom is furnished is added a supplementary apparatus of the same kind, but smaller. Suppose the first apparatus bears the cards of the body and border pattern, and the secondary the cards of a central design. The harness from both machines conjoin near the malle which lift the threads, and when the weaving has progressed to the point where the central design commences, a block plate is lowered between the needles and the cards of the primary machine which renders it inoperative, and the cards on the secondary machine are brought into operation. When the design is completed the second apparatus is thrown out of gear, the block on the primary removed, the needles of which resume their action. Among the important improvements of the Jacquard loom may be mentioned the Bonelli and the Durand looms. The former applies electricity to replace the cards used in the Jacquard for pushing in the needles. The pattern is painted with a resinous ink on an endless band of paper covered with tin-foil. This band of paper with the metallic surface is made to pass under a series of metal teeth connected with a galvanic battery, and in so doing to establish electric circuits, and to produce as many electric currents as there are teeth in contact with the tin-foil. These currents magnetize an equal number of electro-magnets, which lie in eight horizontal rows in the same lines with the rows of needles. The resinous ink used in painting the pattern on the tin-foil has, however, the effect of rendering those parts of the band of tin-foil over which it is spread non-conducting, and hence of preventing the production of currents through the metal teeth that come in contact with those parts, and the magnetizing of the electro-magnets corresponding to those teeth. At every movement of the band of tin-foil, consequently, there are a number of magnets magnetized corresponding to the unperforated parts of the card for a particular portion of a pattern in the Jacquard loom, and a number left unmagnetized corresponding to the holes pierced in the card. Now opposite the rows of magnets are similar rows of small iron rods contained in a movable frame. By the motion of this frame the ends of these rods are brought in contact with the electro-magnets; and those magnets which are magnetized retain the corresponding rods, while those which are not magnetized allow the rods to be carried back by the returning movement of the frame. During this return the rods that are carried back with the frame are by a simple mechanical contrivance temporarily fixed in their position; and since the frame in this return movement is carried to the points of the needles some of these are pushed back by the rods carried with it, while others keep their position, their points being received in the holes left by the rods which are held by the magnets.

One of the latest and best forms of the Jacquard loom is the electrical one patented and manufactured by The Carver Looms Company, Ltd., Glasgow, and shown in operation at the Glasgow International Exhibition of 1901. The following account of it is taken from the Handbook on the Industries of Glasgow and the West of Scotland, which was published by the Local Committee for the meeting of the British Association in Glasgow in 1901: 'The machines of the Carver Looms Company, Limited, constitute a simple attachment to the present Jacquard machines, to which they can be clamped in a few hours to replace the card mechanism, and they electrically interpret the design from a single metallic sheet bearing the pattern. These pattern-sheets are produced in any number from the original design so rapidly and at such a low cost that it is cheaper and

more convenient not to preserve them, but simply to preserve the original design, and reproduce at any time they may be required any number of working plates from it, the pattern being removed after use from the metal, which can thus be used indefinitely. The electro-magnetic system employed is such that the machines effect their object with an exceedingly small expenditure of electrical energy. The metallic pattern-sheet is arranged about 5 feet above the ground level, so that it is immediately under the eye of the attendant, and it can be taken out of the machine and another substituted for it in a few seconds.'

Looms in which a striped warp of coloured yarns can be crossed with similar or contrasting colours are called 'check' or 'shuttle' looms, and are supplied with two or more boxes at one end of the lay for the reception of shuttles containing the different colours of weft. In the majority of cases the shuttle-boxes are arranged one over another, horizontally, at one end of the lay, and are raised to or lowered from the level of the shuttle-race, as required, by means of levers actuated by a revolving barrel, the surface of which is pierced with holes which are set with pins after the Jacquard principle, so as to produce any given pattern. When the boxes are all at one end of the lay a shuttle of any particular colour can never make less than two shots. By having an equal number of boxes on each end of the lay, however, a single thread of any colour required, or any odd number of threads, can be put in as desired; this arrangement is called the 'pick-and-pick' plan. In other cases the boxes are made to revolve round a centre. A very effective check motion is attached to a loom manufactured by the Anderston Foundry Co., Ltd., Glasgow (see Plate II.). In this loom the Jacquard attachment is driven by means of the rod *a* attached to driving-shaft *b*, which also directly drives the lay—the shuttle-boxes of which are seen at *c*. The picking-sticks *d* are worked by means of wipers or picking-cams, which impact on bars projecting from vertical shaft *e*, on the top of which the picking-stick is fixed. Three toothed wheels, *fff*, regulate the cloth-beam, and at the same time are the means whereby the thickness of the cloth is determined. The check-motion consists of a barrel *g*, which is perforated with a number of holes for the reception of pins of a size and number according to the pattern design, and consequently the number of shuttles containing different colours required. In the revolution of the barrel each hole is equal to two shots: where no pin is inserted the top box, or the one which usually rests in line with the shuttle-race, is used; where a pin of the lowest height is put in, it lifts one box, one a little higher the second box, and so on till the end of the series or pattern. Two pendants *h h*, one of which is up while the other is down, regulate the motion of the barrel till a large pin put at the end of the pattern shifts the pendant and reverses the barrel, when the pattern is begun again from the beginning. This barrel acts through a horizontal rod on the bottom part of a quadrant, which contains two notched horizontal levers. The levers of a bell-crank, which are kept moving every second shot by a cam on the under shaft of the loom, have each a pall or catch which engages with the notches in the horizontal levers, and shifts the shuttle-boxes up or down one or more spaces at the instant the pattern-barrel indicates a change of shuttle. A pair of springs attached to the bell-crank levers yield when any hitch occurs, such as the shuttle piker not being properly taken back at the compound-box end of the lay, or when any obstruction takes place in the shifting of the shuttle-box. This obviates the necessity of having a separate mechanism for stopping the loom when an accident occurs.

For plain and fancy twills, spots, satin checks, &c., or, in fact, any fabric which does not require more than sixteen leaves of heddles for its production, what is known as the *Dobby* loom is a very simple and efficient machine. In the latest form of this loom the heddles are attached to two parallel series of horizontal coupled levers, one series above and one below. In connection with the upper series are a grooved pattern cylinder and a sheaf of vertical hooked needles which connect with the upper set of coupled levers. Into the grooves of the cylinder a connected chain of perforated cards fit. Square-headed pegs of wood are fitted into certain of these perforations, in accordance with the pattern desired, and these as the cylinder revolves come in contact, in due order of time, with the vertical needles, which, by means of their hooks, raise the respective levers which work the shed and form the pattern. The lower series of levers are furnished with strong spiral springs, which draw the heddles down into their original position as soon as the pressure of the studs on the vertical needles are withdrawn.

The Lappet loom is one suitable for weaving either plain or gauze cloths, and also for putting in representations of flowers, birds, or the like. The lappet figures are formed by the threads being passed through a series of needles set in a frame, which is placed between the reed and the shuttle-race. This frame is made to slide backwards and forwards from right to left, the needles being raised at the proper moment so as to allow the weft to pass under the figuring threads, and so bind them into the cloth.

Looms for weaving narrow-wares, such as ribbons, tapes, &c., were formerly of considerable breadth, for the purpose of taking in a greater number of warps. Each web had its own warp on a bobbin or beam, and each had its own shuttle. When weaving goods with figures on them, the Jacquard was applied. The form of loom now in use has usually an eye-pointed needle, which traverses the shed and back again between each movement of the harness, the loop of the weft being locked at the selvedge by the passage through it of a shuttle and its thread.

Cross weaving is a term applied to that process in which, as in gauze weaving, the warp-threads, instead of lying constantly parallel, cross over or twist around one another, thus forming a plexus or interlacing independent of that produced by the weft.

Double weaving consists in weaving two webs simultaneously one above the other, and interweaving the two at intervals so as to form a double cloth. Kidderminster or Scotch carpeting is the chief example of this process.

Pile weaving is the process by which fabrics like that of velvet, velveteen, corduroy, and Turkey carpets are produced. In the weaving of these fabrics, besides the ordinary warp and weft, there is what is called the pile-warp, the threads of which are left standing in loops above the general surface till cut, and the cutting of which constitutes the pile.

Among the curiosities of weaving machinery may be mentioned a convex-weaving machine for the manufacture of several articles of clothing, having convex surfaces, and also a circular loom in which the shuttle moves in a circular race and continuously in one direction through warps arranged in a circle. The fabric in one form of this loom, used for weaving akirts, &c., is woven round a block suspended below the frame which supports the warp. The shuttles move in a circular or other endless track, and interweave their threads with the warp threads round the block.

WEBER, KARL MARIA FRIEDRICH ERNST, BARON VON, an eminent German musician, was born in Eutin, 18th December, 1786. His father, a man of volatile

disposition, was a chapel-master in that capital, but his numerous schemes led him to travel about Germany, and his son, who accompanied him, received from too many masters a liberal but irregular education, chiefly directed to art. He remained for some time undecided between music and painting, but at an early age showed a decided predilection for the former. In Hildburghausen he received in 1796-97 from Haushkel the basis of an excellent style as a piano-forte player. In 1798 he enjoyed in Salzburg the instructions of Michael Haydn, and had six little fugues printed as his earliest work. During the same year he pursued his studies under the celebrated singing-master Wallishauser, and the excellent organist Kalcher. While studying harmony and composition under Kalcher he wrote his first opera, *Die Macht der Liebe und des Weins*, *The Power of Love and Wine*, and several other pieces, which were afterwards committed to the flames. The art of lithography having been invented by Senefelder, the Webers, father and son, thought to excel him in that art, which was still imperfect, and to free themselves from dependence on publishers by lithographing their own works, and in this same year they printed *Six Variations for the Piano-forte*, No. 1. In 1800 they came to Freiburg on the Saale, where they thought to establish their new art on a large scale; but their means failing, the project was abandoned, and young Weber, who had felt the occupation too mechanical for his genius, returned to music. Here he wrote the opera of the *Waldmädchen*, which was performed at Chemnitz, and afterwards in several other places; another opera, written in the following year, and highly commended by Michael Haydn, was performed at Augsburg in 1802. In 1803 he came to Vienna, and placed himself under the instructions of the Abbé Vogler, an enthusiastic teacher, who acquired a great influence over him. For a year he studied under the directions of this master, and almost abstained from composition himself. Vogler procured him a musical directorship in Breslau, on which he entered in autumn, 1804. Here he wrote the opera of *Rübezahl*, which was never finished, and of which only the overture (called *Zum Beherrscher der Geister*) is known. In 1806 he went to Carlsruhe on the invitation of Prince Eugene of Würtemberg. Here he wrote two symphonies and some miscellaneous pieces. After some professional journeyings, partly caused by the war, and a residence in Stuttgart, he came in April, 1810, to Darmstadt, where he found his teacher Vogler, and resumed his studies under him in company with Gänsbacher and Meyerbeer. Here he composed many overtures, sonatas, and symphonies for the piano-forte, the cantata *Der erste Ton*, and the opera of *Sylvana* based on the *Waldmädchen*, and which may be regarded as the forerunner of his master-pieces *Freischütz* and *Euryanthe*. In 1810 he produced at Manheim the operetta of *Abu Hassan*. In 1811 he made a professional journey through Germany and Switzerland. From 1813 to 1816 he directed the opera at Prague. After the battle of Waterloo he composed the cantata *Kampf und Sieg* (*Battle and Victory*). In 1816 he went to Berlin, where he wrote his beautiful sonatas in A sharp and B flat, and various other works. Towards the close of this year he went to Dresden as director of the German opera, a post which he held till his death. Besides a mass, an offertory, and various instrumental pieces, he wrote the music to *Preciosa* and the opera of *Freischütz*, which was first performed in Berlin on 21st June, 1821. In 1822 *Euryanthe* was produced on commission for Vienna, and was brought out there in August, 1823. The fame of Weber was now wide-spread, and in 1824 he was requested by Charles Kemble to write

an opera for Covent Garden, for which Oberon was selected as a subject. To fit himself for this task Weber studied English. It was brought out under his superintendence on 12th April, 1826, and met with an enthusiastic reception. He had come to London in February suffering from disease of the lungs, and the unfavourable season hastened the progress of his malady. He conducted with difficulty a benefit concert on 28th May, and expired in bed on the night of 4th-5th June. He was buried in the Roman Catholic chapel of Moorfields, but in 1844 his body was removed to Dresden, before the theatre of which town a statue of him, by Reichel, was erected in 1860.

WEBSTER, DANIEL, a celebrated American statesman, was born on 18th January, 1782, in the township of Salisbury, New Hampshire, where his father was a farmer. He studied for four years at Dartmouth College, and having adopted the legal profession, and spent some time in acquiring a practical knowledge of its details, was admitted as a practitioner in the Court of Common Pleas for Suffolk county. In May, 1807, he was admitted as an attorney and counsellor of the superior court of New Hampshire, and in September of the same year removed to Portsmouth, where he continued for nine years. In 1813 he was returned to Congress by the Federal party in New Hampshire, and from that period to the close of his life took a prominent part in public affairs, being especially distinguished as an orator for lucidity of argument, soundness of logic, and at times great fervour and earnestness. No public speaker could surpass him in producing an impression on an audience, and the same qualities which distinguished him in Congress were conspicuous in his practice at the bar as a lawyer. In 1816 he took up his residence in Boston, for which he was elected in 1822, and again in 1824 and 1826. He became a senator in 1828, and in 1836 was an unsuccessful candidate for the presidency. His only visit to Europe was made in 1839. In 1841, under the presidency of General Harrison, he was appointed secretary of state, a capacity in which he negotiated with Lord Ashburton, in 1842, the Oregon (or Ashburton) treaty between Great Britain and the United States. Another unsuccessful canvass for the presidency was made by him in 1848, and in 1850 he succeeded General Taylor as secretary of state under President Fillmore. This office he continued to occupy till his death, which took place at his estate at Marshfield, Massachusetts, on 24th October, 1852. A collection of his speeches, state papers, and correspondence was published at Boston in six volumes, the year previous to his death.

WEBSTER, JOHN, dramatist, son of a London tailor, was born about 1580. He appears to have followed his father's occupation, and in 1604 he was a freeman of the Merchant Taylors' Company. In 1602 he began to write plays in collaboration with other playwrights, but he attained to his full power only when, between 1607 and 1612, he adopted independent authorship. He added to *The Malcontent*, a play by John Marston, and he was associated with Dekker in writing the two vigorous prose comedies, *Westward Hoe* (acted 1604) and *Northward Hoe* (acted 1605). *The White Devil*, a tragedy published in 1612, was his first independent work, and is now recognized as one of the best tragedies of its age. *Appius and Virginia*, published in 1654, followed soon afterwards, and in 1616 his masterpiece, *The Duchess of Malfi*, was first produced at the Blackfriars Theatre. It was first published in 1623. This great tragedy, which has won enthusiastic praise from Charles Lamb and many subsequent critics of eminence, is based on a Neapolitan story

found in Bandello. *The Devil's Law Case* was published in 1623, and appears to have been Webster's last play. Of other plays sometimes ascribed in part to Webster, only *A Cure for a Cuckold* (published in 1661) seems to contain any of his work. Webster wrote in 1624 a pageant for the Lord Mayor of London, and in 1612 he was associated with Heywood and Tourneur in producing *Three Elegies to the Memory of Prince Henry*. He also contributed verses to other works. His death probably occurred in 1625. There are editions of Webster's works by Dyce (four vols., 1830; new eds., 1857 and 1886) and Hazlitt (four vols., 1856). J. A. Symonds edited a selection in the Mermaid series in 1888, and there is an edition of *The Duchess of Malfi* in the Temple Dramatists by C. E. Vaughan (1896).

WEBSTER, NOAH, lexicographer, was born in Hartford, Connecticut, 16th October, 1758. In 1774 he entered Yale College, but his studies were interrupted by the outbreak of the revolutionary war, in which he served under his father as a volunteer. He graduated in 1778. He was admitted to practise law in 1781, but the unsettled state of the country left him no immediate opportunity of obtaining a suitable opening in this profession, and in 1782 he removed to Goshen, N.Y., where he taught a classical school. Soon after, he published his *Grammatical Institute of the English Language*, in three parts, Part 1 (1783) containing *A New and Accurate Standard of Pronunciation*; Part 2 (1784), *A Plain and Comprehensive Grammar*; Part 3 (1785) *An American Selection of Lessons in Reading and Speaking*. The first part of this work afterwards became popularly known as Webster's Spelling-book. Up to 1847 the sale amounted to 24,000,000, and it has since reached far more than double that number. His literary activity was henceforth very great, and among works issued by him during the next few years we may mention *Sketches of American Policy* (1784-85); *Examination of the Leading Principles of the Federal Constitution* (1787); and *Dissertations on the English Language* (1789), previously delivered as lectures. In 1789 he settled at Hartford to practise law, and in the autumn of the same year he married. For some years his business continued to prosper, but political considerations induced him to remove in November, 1793, to New York, where he established a daily paper, the *Minerva*, for the purpose of supporting the government. He published in 1794 a pamphlet on the Revolution in France, and he wrote ten essays under the signature of 'Curtius', in favour of the treaty of 1795 with Great Britain. These publications had a powerful influence in stemming the tide of feeling in favour of a French alliance. In connection with a visitation of yellow fever he made a special study of the history of pestilential diseases, and wrote a work on contagious diseases which was published in England and America in two vols. 8vo, 1799. In the previous year he had removed to New Haven. In 1802 he published *A Historical Investigation of the Rights of Neutrals, and Historical Notices of the Origin and State of Banking Institutions and Insurance Offices*. In 1806 he published an 8vo *English Dictionary*. In 1807 he published a *Philosophical and Practical Grammar of the English Language*, in which he adopted a new nomenclature, which has not been received. He now entered on the preparation of his great work, the *American Dictionary of the English Language*. Having collected many new words, and carried out researches through the various languages related to English, he proceeded to the completion of his dictionary, and in 1824, when it was nearly finished,

he visited Europe to procure such information as he had been unable to obtain in America. After a short stay in Paris he went to England, where he finished his dictionary during an eight months' residence in Cambridge. In June, 1826, he returned to America. An edition of 2500 copies of his dictionary was published in 1828, followed by an edition of 8000 in England under the superintendence of E. H. Barker. In 1840 he published a second edition in two vols. royal 8vo, with extensive additions to the vocabulary and corrections of definitions. In 1843 he published in one vol. 8vo, a Collection of Papers on Political, Literary, and Moral Subjects, being a reprint of some of his earlier writings. He died 28th May, 1848. Webster was throughout life associated with many of the most eminent men of his country, and always took an active share in public life, supporting his party chiefly by his pen. Several enlarged and improved editions of his dictionary have been published since his death both in America and in England, and it has always held its place as a standard work.

**WEDGE**, a piece of wood or metal, thick at one end and sloping to a thin edge at the other, used in splitting wood, rocks, &c. The wedge is one of the mechanical powers, and besides being used for splitting purposes, is used for producing great pressure, as in the oil-press, and for raising immense weights, as when a ship is raised by wedges driven under the keel. If the power applied to the top were of the nature of a continued pressure, the wedge might be regarded as a double inclined plane, and the power would be to the resistance to be overcome as the breadth of the back to the length of the side, on the supposition that the resistance acts perpendicularly to the side. But since the power is usually that of percussion with a hammer, every stroke of which causes a tremor in the wedge, which throws off for the instant the resistance on its sides, no certain theory can be laid down regarding it. To calculate the power we require the additional elements of weight of the hammer, momentum of the blow, and the intervals between the blows, and further the amount of tremor in the wedge and its antagonism to the resistance on the sides. All that is known with certainty respecting the theory of the wedge is that its mechanical power is increased by diminishing the angle of penetration.

**WEDGWOOD**, **JOSIAH**, the celebrated potter, was born at Burslem, in Staffordshire, July 12, 1730. He was the son of Thomas Wedgwood, a manufacturer of pottery in the district. The art was then in so poor a state that pottery was largely imported from the Continent. Wedgwood received little education, as, his father being then dead, he was employed in his brother's work at the age of nine. An incurable lameness, the result of small-pox, and which subsequently compelled him to have his right leg amputated, compelled him to give up the wheel. He removed for a time to Stoke, where he entered into partnership with persons in his own trade, and where his talent for ornamental pottery was first displayed. In 1759 he returned to Burslem, and set up a small manufactory of his own, in which he made a variety of fancy articles. His business improving, he extended it to white stoneware, and to the cream-coloured ware for which he became so famous. Having made a table-service of this ware for Queen Charlotte, he was appointed potter to her majesty. He now opened a warehouse in London, and his partner Bentley procured him vases, sculptures, cameos, and other appropriate articles for imitation. He succeeded in producing a ware so hard and durable as to render works of art produced in it almost indestructible, and also to be of great service for the

manufacture of vessels exposed to the action of acids in chemical and manufacturing processes. He also succeeded in executing paintings on pottery without the artificial gloss so detrimental to the effect of superior work. In 1771 he erected a work at Etruria, a village in Staffordshire, which he founded, and where he built a mansion for himself and houses for his workmen. His improvements in pottery, which included form, substance, and decoration, in all of which he attained an excellence rarely equalled, created the great trade of the Staffordshire Potteries, which even during his lifetime acquired a remarkable expansion. He made fifty copies of the Portland vase, which were sold for fifty guineas each, a sum which it is said did not cover his expenditure in their production. He took an active interest in matters of public interest, was one of the leading promoters of the Trent and Mersey Canal, founded the General Chamber of the Manufactures of Great Britain, and was a member of the Royal Society and the Society of Antiquaries. He died at Etruria, 8d January, 1795. See **POTTERY**.

**WEDNESBURY**, a parl. and mun. borough of England, in Staffordshire, 19 miles S.E. of Stafford, with a Gothic parish church on the summit of a hill at the northern extremity of the town; several other churches and chapels, a town-hall, free library, a mechanics' institute, public baths, a benevolent society, an alms-house, and several schools. The principal manufactures are railway-carriages, patent axles, and general ironwork for railways; steel tubing for gas and water, and steam-pipes; gun locks and barrels, springs for coaches, hinges, nails, screws, spades, shovels, edge-tools, and wrought-iron work of every description. The borough, which includes the parishes of Darlaston and Tipton, sends a member to Parliament. Pop. of mun. bor. (1891), 25,347; (1901), 26,544; of parl. bor., 69,083 and 72,478.

**WEDNESDAY**, the fourth day of the week, in Latin, *dies Mercurii*, whence the French *Mercredi*, the Italian *Mercoledì*, &c. The Germans call it *Mittwoch* (mid-week). The English name is derived from the old Scandinavian deity Odin or Woden. In Anglo-Saxon it is *Wodnesdag*; in Swedish, *Odensdag*; in Dutch, *Woensdag*. We find the same prefix in the name of some English towns: Wednesbury, Wednesfield, &c. See also **ASH-WEDNESDAY**.

**WEEK**, a period of seven days, one of the common divisions of time. The week is not a natural division of time, and the question when, why, and by whom it was first adopted necessarily arises in connection with its actual prevalence. The only natural explanation offered is that it has been adopted as a quarter lunation; but as there is no absolute necessity for dividing the month into four, and a large fraction is needed to make the weekly square with the lunar periods, this explanation is not satisfactory. The week is, in fact, a much closer division of a year than of a month; but the division of the year into fifty-two portions is so purely arbitrary that this can hardly suggest the origin of the week. The convenience of some short recurring period or cycle of days is obvious, and it is the prevalence alone, and not the occurrence of a particular cycle, that has to be accounted for. The practice of antiquity on the subject does not seem to have been so uniform as is sometimes supposed. Among the nations who adopted the week as a division of time, the Chinese, Hindus, Egyptians, Chaldeans, Jews, Persians, and Peruvians have been mentioned, but in some cases the antiquity of the practice is doubtful, and in others the name has been applied to other cycles than that of seven days. The nations with whom the weekly cycle has been traced with certainty to the greatest antiquity are the Egyptians



and the Hebrews. With the former we only know of its existence, but with the latter it had a much more important character. Their earliest records speak of its existence, and refer it to a period previous to that of the nation itself. Laban, the uncle of Jacob, alludes to the week as an established measure of time in Gen. xxix. 27. The origin of the week is further ascribed in the Jewish Scriptures to the creation of the world, and is wrought into the institutions of the nation in a variety of ways, but particularly by the consecration of the seventh day to the worship of the Creator. The Hebrew word for week is of a general signification, and applies equally to a period of seven days, seven months, and seven years, each of which had a particular celebration attached to it in the Hebrew ritual, hence the use of days to represent years in the prophetic writings is according to the natural genius of the language. The number seven had a mystic significance attached to it in the symbolism of the Jewish religion in a variety of other ways. The Romans and Greeks each divided the month into three periods (see CALENDAR), and were not acquainted with the week till a late period. The Romans, however, had for civil uses, as the arrangement of market-days, a cycle of eight days, the ninth day being the recurring one, instead of the eighth, as with us. The use of the week was introduced into the Roman Empire about the first or second century of the Christian era from Egypt, and had been recognized independently of Christianity before the Emperor Constantine confirmed it by enjoining the observance of the Christian Sabbath. The names given by the Romans to the days of the week, and which have pervaded Europe, were derived from the planetary system, which was supposed to consist of the sun, moon, and five planets, Mars, Mercury, Jupiter, Venus, and Saturn. With the Mohammedans the week has also a religious character, Friday being observed by them as a Sabbath. It is supposed by some authorities that they introduced the week to India. The Chinese week is said to consist of five days, named after the five elements, iron, wood, water, feathers, and earth. See articles on the different days of the week.

WEEKS, FEAST OF. See PENTECOST.

WEEPER-MONKEY, or SAI (*Oebis Capucinus*) a species of Platyrrhine Monkeys, forming one of the Capucina. This species inhabits Brazil.

WEeping TREES are trees with long and drooping branches. The best known and most elegant are varieties of the ash, the birch, and the willow. The Weeping Ash (*Fraxinus excelsior*, var. *pendula*) differs from the common ash only in its branches growing downwards instead of upwards, so that if it is grafted on a lofty stem the branches will in time reach the ground and form a natural arbour. The Weeping Birch (*Betula alba*, var. *pendula*) differs from the common birch, not only in its drooping branchlets, but also in its young shoots being quite smooth, bright chestnut brown when ripe, and then dotted over with little white warts. Coleridge calls this tree the 'lady of the woods.' The Weeping Willow (*Salix Babylonica*), among the finest of ornamental trees, is a native of the basin of the Euphrates, but it thrives well in England if the situation is not too cold for it and if it is planted near water. It rises to a considerable height, and no tree can be more graceful on the margin of a lake or stream. It is said that the first weeping willow in England was planted by the poet Pope. Having received a present of figs from Turkey, he observed a twig of the basket in which they were packed putting forth a shoot. He planted this twig in his garden at Twickenham and it soon became a fine tree, from which stock

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many of the weeping willows of this country have sprung. This tree, so remarkable on every account, was cut down many years ago.

WEEVER, a genus of Teleostean fishes, belonging to and exemplifying the family Trachinidae. These fishes are nearly allied to the Perches, and have two dorsal fins, of which the front one is small, but strongly spinous. The ventral fins exist on the throat. The skin is covered with smooth cycloid scales. The body is usually elongated and the head broad; and the eyes are frequently placed on the upper surface of the head. The second dorsal and anal fins are of great length. No air-bladder exists. The Great Weaver or Weaver (*Trachinus Draco*) inhabits our own seas, and is also known under the designations of 'sting-bull' and 'sea-cat,' from the wounds it is capable of inflicting by means of the sharp spines of the first dorsal fin and those of the gill-covers. Very painful effects follow the wound, and usually the fishermen cut off the first dorsal fin and gill-cover whenever the fish is caught. The name weaver is a corruption of the French term *La Vire*, given to this fish from its tenacity of life. The length is about 12 inches or more, and the colour is a reddish-gray above and light gray below; the gill-cover being streaked with yellow. The Lesser Weaver (*T. ripera*), also named 'sting-fish,' attains a length of 5 inches. This species buries itself in mud, and inflicts severe wounds by means of its spines on any unwary intruder. This species is coloured like the preceding; its first dorsal fin is black, and the tail-fin is edged with that colour, the other fins being brown.

WEEVIL, a general name applied not only to various genera of adult beetles or Coleoptera, but also to their caterpillars or larvae. Most of these beetles belong to the family Curculionidae. The larva of the Pea-weevil (*Bruchus Pisi*) damages peas, the eggs being laid when the peas are ripening. The mature insect is of a black colour, marked with white spots, and about  $\frac{1}{2}$  inch long. Several species are named Corn-weevils, from their destructive effects in granaries. *Bruchus granarius* also attacks peas, and one species infests the cocoa-nut. The *B. Pisi* was at one time so destructive in North America that its ravages threatened to wholly exterminate the pea-crops. Another well-known enemy of the granary is the Corn-weevil (*Calandra granaria*), a little beetle of a dark red colour, and about  $\frac{1}{2}$  inch long. The eggs are deposited on the corn after it is stored, and the larvae burrow therein, each larva inhabiting a single grain. The Rice-weevil (*C. oryzae*) destroys rice and Indian-corn in a like fashion. This latter species has four red spots on the elytra or wing-covers. Another species (*C. palmorum*) infests palm-trees. It is common in Guiana, and attains a length of 2 inches, the larvae burrowing in the pith of the trees. *C. sacchari* inhabits sugar-canes, and is destructive in the West Indies. The negroes consider the larvae of these latter as delicacies, and eat them boiled. The genus *Rhynchites*, of which the Grass-weevil or Lisette (*R. Bacchus*) is an example, is also included among the Weevils. This species devastates the growing vines, and strips them of their leaves. The *R. Bacchus* is coloured of a reddish-tint. In all Curculionidae a beak or rostrum is developed, and the antennae are usually short. Several Weevils are shown on Pl. II. at ENTOMOLOGY, fig. 13 being the *Bruchus Pisi*, fig. 14 *Calandra granaria*, fig. 15 *Rhynchites betuleti*, fig. 16 *Hylesinus trifolii*, fig. 17 *Bostrychus typographicus*, and fig. 18 *Scolytus pruni*.

WEIGHING MACHINE. See BALANCE.

WEIGHTS AND MEASURES. In view of the exceedingly varied and often very minute differences that exist in the weights and measures of different countries, and even within the boundaries of the



same country, in different localities, it is not necessary to dwell upon the advantages that would accrue from the adoption of a uniform and complete system of weights and measures for the civilized world. It is granted, on all sides, that uniformity would be a desirable arrangement, were we called upon to settle the matter, for the first time. But such is not the case. We have to deal with a net-work of prejudice, and a dead weight of habit, which can scarcely be appreciated by any one who is not in the custom of dealing with our small farmers and the humbler, but more numerous members, of the agricultural class. Each county used to have its own weights and measures. In Bedfordshire, wheat was sold by the load of 5 imperial bushels of 8 gallons each; in Cheshire, the bushel measured 9 gallons and  $\frac{1}{4}$ ths of a gallon. At Lauceston, the Cornish bushel held 16 gallons; at Helston, 24 gallons. In Middlesex, the bushel contained 8½ gallons; in Monmouth, 8 gallons. Suffolk had its coomb, Northumberland its boll. Flint was among the most eccentric of all the counties. The mode of selling wheat, oats, and barley in that county varied, but it was generally done by 'hobbet'. The hobbet of wheat was equal to two measures, or four strikes, or 21 gallons, or 168 pounds. In Glamorganshire, they carried on business by help of a 'stack' of 3 imperial bushels for wheat; and for oats, of 6 imperial bushels. In different parts of the country, they had a local measure which they called a Welsh bushel. These instances, amongst many others that could be mentioned, show the ridiculous diversities of practice which prevailed in so simple a matter as the sale of grain, in different parts of England. Manifestly nothing could be better adapted to check the freedom of transactions, than a system by which a bushel at one end of the country meant one thing, and another at another. The farmer in Suffolk, conversant only with 'coombs', would write to his correspondent in Northumberland, to inform himself of the price of grain. An answer came that it was so much per boll, and, if he took the trouble of looking at the Flintshire papers, he would find that, on a certain day, prices ranged so much per hobbet. At Mark Lane, however, he could only sell by the quarter! By an act passed in 1873, the use of all such weights and measures was abolished in favour of the imperial standards.

The old standard Scotch pound troy, kept at Lanark, was anciently considered the unit of weight. By this unit, the stipend in meal to many of the clergy in Scotland was paid. Its actual weight was 7609 grains, whereas the English troy pound was only 7560 grains. The unit of dry measure was the firiot, the standard of which was kept at Linlithgow. The wheat firiot was a little over one Winchester bushel, whilst the barley firiot amounted to nearly 1½ Winchester bushel. The dry measure also used immemorially and universally in Scotland, for grain, meal, &c., was the boll,—of four firiotics—a name only, and not an invariable quantity, as its contents varied in different counties. It is still commonly used in Scotland. In Edinburgh at the present time, the commonest measure for meal is called the 'forpit,' being the fourth part of a peck, of which there are four to the firiot. The unit of Scotch liquid measure was the Scotch pint 'of just Sterline jug and measure,' defined in the Scotch Act of 1618 as being '3 pounds 7 ounces of French Troyes weight of clear running water of the water of Leith.' It is needless to say that the natural standard here quoted has long since vanished. The Scotch pint was a little over a third of an imperial gallon. The unit of Scotch measures of length was the Scotch ell, the principal standard being the elwand, or ell, kept at Edinburgh; the length of which was 37·096 inches.

The standard weights and measures of England were legalized in Ireland as early as the year 1495; and they were practically in general use there at a still earlier period.

The origin of English measures is the grain of corn. Thirty-two grains of wheat, well dried, and gathered from the middle of the ear, were to make what was called one pennyweight; 20 pennyweights were called one ounce; and 20 ounces, one pound. Subsequently, it was thought better to divide the pennyweight into 24 equal parts, to be called *grains*. William the Conqueror introduced into England what was called *TROY WEIGHT*, from Troyes, a town in the province of Champagne, in France, now in the department of Aube, where a celebrated fair was held. The English were dissatisfied with this weight, because the pound did not weigh so much as the pound at that time in use in England; consequently, a mean weight was established, making the pound equal to 16 ounces. Hence arose the term *avoirdupois* (*avoir du poids*), descriptive of the new pound, which was made legal in the reign of Henry VII. But the Troy pound was not entirely displaced by the avoirdupois; on the contrary, it was retained with subdivisions in medical practice according to the scale known as the old apothecaries' weight, and for the weighing of gold, silver, jewels, and such liquors as were sold by weight. It has latterly, however, been abandoned for apothecaries' purposes, and the avoirdupois scale has been substituted.

The *grain* is the ultimate English measure of weight, and it is the base of both the avoirdupois and the troy scales of weight. There are 7000 grains in one pound avoirdupois, and there are 5760 grains in one pound troy; hence the troy is to the avoirdupois pound as 144 to 175, or nearly as 1 to 1·215. Although the troy pound nearly became obsolete, in commercial use, it was nevertheless retained as the standard by the act of 1825; and in order that the standard, in case of damage or destruction, might be restored, by reference to a natural standard, it was ascertained that a cubic inch of distilled water, at a temperature of 62° Fahr., weighed, in air, 252·458 grains; and it was directed that the standard pound should be restored, by the making of a new standard troy pound, weighing 5760 of such grains.

The original measure of length was that of a grain of barleycorn; three grains, well dried, placed end to end, making one inch—the basis of length. The length of the arm of King Henry I. was made the length of the *ulna* or ell, which answers to the modern yard. The standard yard was, by the act of 1825, defined as 'the straight line or distance between the centres of the two points in the gold studs in the straight brass rod whereon 'standard yard, 1760,' is engraved, which shall be the original and genuine standard yard; and that the same straight line in the said brass rod (the brass being at the temperature of 62 degrees by Fahrenheit's thermometer) shall be denominated the 'imperial standard yard,' and shall be the unit or only standard measure of extension, wherefrom all other measures of extension whatsoever, whether lineal, superficial, or solid, shall be derived, computed, and ascertained; and that all measures of length shall be taken in parts or multiples,' and so on.

Though it does not clearly appear why this particular length was fixed upon, it may be conjectured that it was taken as a multiple of the inch 36 times, or three dozen inches. When the length was definitely fixed, it operated reflexly, in fixing the length of the inch as one thirty-sixth part of a yard. But it was essential that the length of the standard yard should always remain the same, and that if ever the standard should be lost or destroyed, it could be

restored by comparison with a datum of length, which should remain constant in perpetuity. This datum was afforded by the length of a pendulum vibrating seconds at Greenwich or in London, at the level of the sea, in a vacuum. The length was found by exact measurement to be 39.1393 inches; and, accordingly, if the length of the seconds pendulum be divided into 391,393 equal parts, the yard is definable as equal in length to 360,000 of these parts.

The imperial gallon is the only standard measure of capacity, and is defined by the act of 1825, as containing 10 lbs. avoirdupois of distilled water at a temperature of 62° Fahr., and under a barometrical pressure of 30 inches, the volume of which was measured as equal to 277.274 cubic inches. It happened, however, that there was a slight error in the measurement of the volume, for it has since been determined that the exact volume of 10 lbs. of distilled water is 277.123 cubic inches. Nevertheless, as the ultimate aim of the measurement was the establishment of a unit of capacity, the legal capacity of the gallon is 277.274 cubic inches, though it holds more than 10 lbs. of water.

An occasion was early offered for giving effect to the principle of restoration by reference to natural standards, by the fire of 1834, by which the House of Commons and the standards it contained were destroyed. This subject was very carefully considered, with a view to the restoration of the standards; and the commissioners unanimously agreed that it was better to trust to the preservation of the standards by material representatives, great care being taken for the conservation of these representatives. The measure of the earth, or the measure of the seconds pendulum, is a work of great difficulty and labour; and, what is worse, its immediate results must be subjected to certain theoretical corrections which, from the imperfections of theory, introduce either error or doubt. So rapidly, in the advance of science, did these vitiate the conclusions, that it was found, in 1836, that the natural basis sanctioned by the legislature, in 1824, would produce results sensibly erroneous. The weighing of water is a very laborious process, liable to considerable uncertainty; the plan adopted, therefore, for the construction of the new standards was the following:—Materials existed,—length-scales which had been compared with the lost yard, and pound weights, which had been compared with the lost pound,—sufficient for restoring the values of the old standards. By means of these, five sets of copies were made, possessing a recognized official value, and thirty sets of copies, which probably were quite as good, but which were not officially recognized in the same way. Of the five official sets, one, the national standard, is preserved at the Exchequer in a stone coffin in a window seat of a groined room; one is immured in a wall of the lower waiting-room of the House of Commons; one is preserved in a bullion-room at the Mint; one at the Royal Observatory, Greenwich; and one was intrusted to the Royal Society.

By the introduction of the metrical system of weights and measures, there can be no doubt that, whatever inconvenience to individuals, in the shape of decapitation, confiscation of property, and so forth, the great French revolution may have drawn with it, the French nation derived considerable benefit in the reform of their weights and measures. It has been the boast of the advocates of the metrical system that it is based upon a single unalterable unit of measure. The standard metre has been defined to be equal to one ten-millionth part of the quadrant of the terrestrial meridian, that is to say, the distance from the equator to the pole, passing through Paris, which, by the latest and most authoritative measurement,

is 39.3762 inches, in terms of the imperial standard at 62° Fahr. But, by the latest and most accurate measurement, the actual standard metre at 62° Fahr. is, in terms of the imperial standard at 62° Fahr., 39.37048 inches, whilst its legal equivalent, declared in the metric act of 1864, is 39.3708 inches, which is the same as that adopted in France.

The standard kilogramme is defined as the weight of a cubic decimetre of distilled water at the temperature of maximum density, 4° Centigrade, or 39.1° Fahr.

In the establishment of the metre as an absolute standard of measure, referable to a natural standard, it will be seen that the same kind of difficulty has arisen that attended the reference of the English standards to natural standards:—the difficulty, or perhaps the impossibility of attaining to absolute exactness of measurement. It follows that, in fact, the metric system is not really founded on the length of a quadrant of the meridian, and although it is described as a scientific system, because of the simple and definite relation between the metre, which is its basis and unit of length, and the kilogramme and litre, which are the units of weight and capacity, it is admitted that it has been found impossible, practically, to carry it out with scientific accuracy. The standard kilogramme is admitted *not* to be actually the weight of a cubic decimetre of pure water at the specified temperature, nor the litre a measure of capacity holding a cubic decimetre of pure water. The real standard of weight is declared, even by men of science in France, to be merely the platinum kilogramme weight deposited at the Palais des Archives, as the real standard unit and basis of the metric system is the platinum metre, also deposited there. It is an accomplished fact, however, that all civilized nations have tacitly agreed to recognise the metric system as affording for the future the advantages of a universal system of weights and measures, and to adopt the standards deposited at the Palais des Archives, as the primary units of the system. There is no practical disadvantage in the necessity for placing reliance solely upon arbitrary standards of measures, for with the means of copying length to an extreme degree of perfection, matured by Sir Joseph Whitworth, the limit of error of measurement may be reduced, with the aid of the sense of touch, to an amount not exceeding one-millionth of an inch.

The exigencies of scientific investigation have vastly extended the scope and range of instruments for making measurements of precision. By measurement for scientific purposes is meant the measurement of quantities. There are geometrical quantities:—as lengths, areas, volumes, angles (plane and solid), curvatures (plane and solid), and strains. There are circumstances of motion:—time, velocity, momentum, acceleration, force, work, horse-power, temperature, heat. There are properties of bodies:—mass, weight, density, specific gravity, elasticity, viscosity, diffusion, surface tension, specific heat. Notwithstanding the very different character of these quantities, they are all measured by reducing them to the same kind of quantity. Every quantity is measured by finding a length proportional to the quantity, and then measuring this length. An angle, for instance, is measured by the length of the arc of a circle by which it is subtended; an area can be measured in terms of length by the planimeter; time is measured by the length of the arc described by the hand over a clock face; the pressure of the atmosphere is measured by the rise and fall of the barometer. See ARTICLES on the various weights and measures, such as AVOIRDUPOIS, TROY WEIGHT, OUNCE, POUND, DECIMAL SYSTEM, articles on the different countries, &c.

**WEIMAR**, the capital of the Grand-duchy of Saxe-Weimar, on the Ilm, 13 miles east of Erfurt. It stands in a beautiful valley surrounded by hills, on ground partly elevated and partly flat. It is irregularly built except in the suburban portions. Its public edifices most deserving of notice are the grand-ducal palace, a handsome structure erected partly under the superintendence of Goethe; the so-called Red and Yellow Castles, now united and occupied by several public departments; the grand-ducal library (in the Green Castle), containing 180,000 vols.; the museum; the Stadtkirche, with an altar-piece, one of the finest works of Lucas Cranach, in which he has introduced portraits of himself and Luther and Melancthon; and the modern Gothic town-house. The public monuments comprise the Goethe-Schiller monument in bronze, statues of Herder, Wieland, the composer Hummel, the grand-duke Karl August, and various others, and a monumental fountain. Goethe's house is now used as a Goethe National Museum, and Schiller's contains relics of its former distinguished owner. A Goethe and Schiller Archives building was opened in 1896. Goethe and Schiller are interred in the grand-ducal vault in the new cemetery. Stretching away from the palace is a fine park on the banks of the Ilm. Weimar has a gymnasium, a real-gymnasium, academy of painting, school of drawing, normal school, and other educational institutions. It has neither trade nor manufactures of much consequence, but as the capital of the duchy it is the seat of the legislature and of all the more important courts and public offices. It long ranked as a sort of 'German Athens' in consequence of the enlightened patronage which the Duke Karl August (died 1828) afforded to Goethe, Schiller, Herder, and Wieland. Pop. (1890), 24,546; (1900), 28,489.

**WEIMAR, SAXE.** See **SAXE-WEIMAR**.

**WEISMANN, AUGUST**, a distinguished biologist, was born at Frankfurt-on-the-Main on Jan. 17, 1834. After studying medicine in Göttingen University he was clinical assistant at Rostock in 1856-57, and in the course of the three years 1858-60 he visited Vienna, Italy, and Paris, devoting himself especially to studies in the natural sciences. He lived for a year at Schaumburg Castle as body physician to the Archduke Stephen of Austria, and in 1863 he went to Giessen to prosecute his zoological studies under Leuckart. Having qualified as a lecturer in the University of Freiburg, he was appointed extraordinary professor there in 1866, and ordinary professor in 1873. His first published work was a treatise on the Development of the Diptera, issued in 1864. It was followed in 1872 by a work On the Influence of Isolation on the Formation of Species, and in 1875-76 by the important two volumes of Studien zur Descendenztheorie. This work, which was translated into English in 1882 by Professor Meldola, under the title Studies in the Theory of Descent (with a preface by Charles Darwin), treats of several important phenomena in natural history from the stand-point of a thorough believer in the doctrine of natural selection. His Beiträge zur Naturgeschichte der Daphnoiden (1876-79) and Die Entstehung der Sexualzellen bei den Hydromedusen (1883) are valuable contributions to the developmental aspect of zoology. A series of treatises followed, in which he developed his characteristic theories, among them being Über die Vererbung (On Heredity), Über die Dauer des Lebens (On the Duration of Life), Über Leben und Tod (On Life and Death), Die Kontinuität des Keimplasmas als Grundlage einer Theorie der Vererbung (The Continuity of the Germ-Plasm as the Basis of a Theory of Heredity), Die Bedeutung der sexuellen

Fortpflanzung für die Selektionstheorie (The Significance of Sexual Reproduction for the Theory of Selection), Über den Rückschritt in der Natur (On Retrograde Development in Nature), and Amphimixis. These have appeared in an English translation under the title Essays upon Heredity and Kindred Biological Problems (vol. i. 1889; vol. ii. 1892). Weismann's other works include: Das Keimplasma (1892), in English as Germ Plasm (1893); Die Allmacht der Naturzüchtung (The Omnipotence of Natural Selection, 1893); Äussere Einflüsse als Entwicklungsreize (External Influences as Stimuli to Development, 1894); Neue Gedanken zur Vererbungsfrage (Fresh Thoughts on the Question of Heredity, 1895); and Über Germinalselektion (On Germinal Selection, 1896). For Weismann's theory of heredity see the article **HEREDITY**.

**WELD.** See **WOLD**.

**WELDING** is the intimate union produced between the surfaces of two pieces of malleable metal, when heated almost to fusion and hammered together. This union is so close, that when two bars of metal are properly welded the place of junction is as strong, relatively to its thickness, as any other part of the bar. Practically, iron is the only metal welded. To weld bar iron to another piece of iron requires an intense white heat. See also **ELECTRIC WELDING**.

**WELLESLEY, PROVINCE OF.** See **PENANG**.

**WELLESLEY, RICHARD COLLEY, VISCOUNT AND MARQUIS**, and Earl of Mornington, eldest son of Garrett, first Earl of Mornington, and eldest brother of the Duke of Wellington, was born at Dublin on the 20th of June, 1760, and educated at Harrow and Eton, and afterwards at Christ Church, Oxford. He distinguished himself in classics, but left Oxford without a degree. On his majority he took his seat as Earl of Mornington in the Irish House of Peers, and three years after was returned to the British House of Commons as member for Beeralston. He afterwards sat as the representative of Windsor (1787-96), and of Old Sarum (1796-97). He was appointed a lord of the treasury in 1786, and in 1793 a member of the board of control. These were only preliminaries to the higher appointment of Governor-general of India, which was conferred upon him in 1797, along with a British peerage under the title of Baron Wellesley. His administration, both for its ability and the large accessions of territory made under it by the conquest of Mysor and the humbling of the Mahrattas, forms an epoch in the history of the British Indian Empire. (See **INDIA** and **WELLINGTON**.) He returned to England in 1805 with the title of marquis, and in 1809 became foreign secretary under Mr. Perceval. He went to Spain on an extraordinary embassy during this year. He had been gradually veering round to liberal views, and in 1812 resigned his place chiefly because he was in favour of Catholic emancipation. He did not return to office till 1821, when he became Lord-lieutenant of Ireland. This post he retained till 1825, when he was removed from it by his brother, the Duke of Wellington, who was an opponent of emancipation and had become prime minister. In the Grey ministry he held the office of lord-steward till 1833, when he again became Lord-lieutenant of Ireland. Displaced in the following year by the Peel ministry, he afterwards held the office of lord-chamberlain for a few months of 1835, and then retired from public life. He died on 26th of September, 1842. There is an edition of his excellent Indian despatches, minutes, and correspondence by Martin (five vols., 1836-37), and a selection by S. J. Owen (1897). See the *Memoirs and Correspondence*

by Pearce (1846), and shorter biographies by Torrens (1880), Malleson (1889), and Hutton (1893).

**WELLHAUSEN, JULIUS**, a distinguished Orientalist and Biblical scholar, was born at Hameln, in the province of Hanover, on May 17, 1844. He studied theology in the University of Göttingen, where he qualified as a lecturer on the Old Testament in 1870. In 1872 he was appointed professor of theology in Greifswald University, but he gave up his chair in 1882 because he could no longer accept the fundamental doctrines of Protestant Christianity. He went to Halle as extraordinary professor of Oriental languages, and in 1885 he was appointed to an ordinary professorship at Marburg, whence in 1892 he removed to Göttingen to occupy a similar post. Wellhausen's name must always be intimately associated with the views now prevalent regarding the nature and sources of the Hexateuch (see *PENTATEUCH*). In 1871 he published a text-critical work on the books of Samuel, and in 1874 appeared his treatise *Die Pharisäer und die Sadducäer*. The first volume of a *Geschichte Israels* was issued in 1878, and a second edition of it in 1883, under the title *Prolegomena zur Geschichte Israels* (5th ed., 1899), but the work has not been completed. The *Prolegomena* was translated into English in 1885 by J. S. Black and A. C. Menzies, with a preface by the late W. Robertson Smith, the volume containing also a reprint of his article *Israel* contributed to the *Encyclopædia Britannica* (9th edition). The last-mentioned article was published separately in 1881 as a *Sketch of the History of Israel and Judah* (3rd ed., 1891), and was included in a German form, as an *Abriss der Geschichte Israels und Judas*, in the first volume of his *Skizzen und Vorarbeiten* (five vols., 1884-92). More recently the *Abriss* has been amplified to form a work on *Israelitische und Jüdische Geschichte* (1894; 4th ed., 1901). His masterly treatise on *Die Composition des Hexateuchs und der historischen Bücher des Alten Testaments* (1885; 3rd ed., 1899) originally appeared in the *Jahrbücher für deutsche Theologie* (1876-77). His remaining works are, in addition to the fourth, fifth, and sixth editions of Bleek's *Einleitung in das Alte Testament*: *Muhammed in Medina* (1882); *Der arabische Josippus* (1897); *Reste Arabischen Heidentums* (2nd ed., 1897), first published in the *Skizzen und Vorarbeiten*; *Die Kleinen Propheten übersetzt, mit Noten* (1892; 3rd ed., 1898); and contributions to the *Encyclopædia Britannica* (9th edition) and the *Encyclopædia Biblica*.

**WELLINGBOROUGH**, a town of Northamptonshire, on the river Nen, 10½ miles north-east of Northampton. It is built on a declivity, and consists of several streets diverging from the market-place. There are a handsome ancient parish church, other places of worship, grammar-school, an endowed commercial school, a technical institute, a public free library, a corn-exchange, county police-station, &c. The chief industries are the manufacture of boots and shoes and shoe-uppers, and the smelting of iron. Pop. (1891), 15,068; (1901), 18,412.

**WELLINGTON**, a market-town of England, in Shropshire, 11 miles east of Shrewsbury. The principal buildings are two churches, Dissenting chapels, post-office, &c. The manufactures include nails, farm implements, brass and iron ware, and malting; and there is a considerable trade in corn, cattle, timber, and lime. Pop. (1891), 5,909; (1901), 6,273.

**WELLINGTON**, a market-town of England, in Somerset, situated a short distance south of the river Tone, about 6 miles w.s.w. of Taunton. It has an old Perpendicular church, with interesting monuments, a modern church, and several Noncon-

formist places of worship; a town-hall or market-house; the West Somerset County School; a literary institution; &c. The manufactures include woollens, bricks and tiles, &c. The great Duke of Wellington took his title from this town, and some distance to the south a pillar has been erected on a hill in memory of the duke and his triumph at Waterloo. Pop. (1891), 6,808; (1901), 7,282.

**WELLINGTON**, a provincial district of New Zealand, in the south of North Island, bounded on the north-west by Taranaki; on the north by Auckland; on the north-east by Hawke's Bay; and on the east, south, and west by the sea and Cook Strait; area, about 11,000 square miles. Its coast is but little indented, the principal openings being Palliser Bay and Port Nicholson in the south. It is traversed throughout almost its whole length by a range of mountains known in the north by the name Ruahine, and farther south as Tararua, and sending off near Cook Strait a branch called Rimutaka. Parallel to this main range, which averages about 4000 feet in height, and nearer the east coast, there is a series of lower ranges called Puketoi, Taipo, Maungaraki, and Haurangi, and between these two chief mountain-systems extends the broad Wairarapa Plain, merging northwards into an undulating country. A considerable extent of fairly level country, increasing in breadth northwards, is also found along the west coast. The Kaimanawa Range in the north of the district should also be mentioned, and above all the great volcanic range, whose chief summits are Ruapehu (9185 feet), Ngauruhoe (7515), and Tongariro (6500). The chief west-coast rivers are the Waitotara, Wanganui, Wangaehu, Turakina, Rangitikei, Manawatu, and Otaki; the Hutt river flows into Port Nicholson, and the Ruamuhanga into Palliser Bay; and to the east coast there flow the Pahaua, Aohanga, and Akitio. The chief lakes of the district are Wairarapa and Onoke in the extreme south. Wellington is well timbered, and timber is one of its chief exports. Much of the surface is admirably adapted for pastoral purposes, and there are now in the district over four million sheep, in addition to large numbers of cattle and horses. Agriculture is also successfully carried on in several parts, the principal crops being oats, wheat, potatoes, and turnips. The number of cheese and butter factories is steadily increasing. Little mineral wealth has been found in the district of Wellington, but some gold has been worked. The chief town is Wellington, the capital of the colony. Besides the elementary public schools there are secondary colleges at Wellington and Wanganui, and the capital also contains Victoria University College. Railways now run from Wellington to Napier and New Plymouth. Pop. in 1901, 141,354.

**WELLINGTON**, the capital city of New Zealand, in the provincial district of Wellington (Hutt county), situated on Lambton Harbour, on the south-west of Port Nicholson, an inlet of Cook Strait, about 1200 miles south-east of Sydney in Australia. Its fine harbour is the safest and most commodious in New Zealand. The principal buildings and institutions of the city are: Government House, a fine building in Italian style, in its own grounds; the houses of legislature, including a parliamentary library building; the government building, a huge structure of wood; the supreme court edifice; Anglican, Roman Catholic, Wesleyan, Primitive Methodist, Presbyterian, Congregational, and other churches; a free public library; Wellington College, a girls' high-school, St. Patrick's College (R.C.), a technical school, and other similar educational institutions; Victoria University College, affiliated to the University of New Zealand; a

general hospital; a lunatic asylum; the Boys' Institute; and the botanical gardens. The city is lighted by electricity, and has a good water supply, and its streets are traversed by electric tramways. The chief industrial establishments are tanneries, candle and soap works, coffee-mills, boot-factories, biscuit-works, foundries, brick-works, saw-mills, woollen-mills, breweries, and meat-preserving works. The town has a patent slip, and has been fortified. Pop. in 1896, 42,196; in 1901, 43,638, or, including suburbs, 49,344.

WELLINGTON, ARTHUR WELLESLEY, DUKE OF, was born previous to 30th April, 1769, on which day he was baptized at St. Peter's Church, Dublin. He was the fourth son of the first Earl of Mornington. His mother was the eldest daughter of the first Viscount Dungannon. He lost his father in his twelfth year. He was educated at Eton, privately at Brussels, and finally at the Military College of Angers. On 7th March, 1787, he received a commission as ensign in the 73d Foot. He was gazetted under the name of Wesley, the family name till it was changed by his brother to Wellesley. After a rapid series of changes and promotions he attained by purchase in September, 1793, the command as lieutenant-colonel of the 33d Regiment, in which he had attained his majority in April of the same year. In 1790, when he became of age, he was returned as member to the Irish Parliament for the family borough of Trim, in the county of Meath. In May, 1794, he sailed with his regiment for Flanders to join the army of the Duke of York. The campaign had taken an adverse turn, and during a protracted retreat Wellesley acquired the command of a brigade of the rear-guard, and was particularly remarked for the ability of his dispositions in checking the pursuit. In the spring of 1795 the army re-embarked for England.

In the following year the 33d Regiment was embarked for India, and Wellesley, who had been prevented by illness from accompanying it, joined it at the Cape, arrived at Calcutta in February, 1797, and was attached to the Bengal service. The Earl of Mornington arrived in India as governor-general in May, 1798. The intrigues of Tipoo Saib (see INDIA) had rendered war inevitable, and Wellesley joined the army under General Harris. Circumstances, as usual, conspired for his promotion. The Nizam of the Deccan desired that the brother of the governor-general should be put in command of his contingent; the 33d Regiment was accordingly attached to the Nizam's contingent, with Wellesley in command. The army entered Mysor in March, 1799. An engagement took place at Mallavelly on the 27th, in which Wellesley, who commanded the left wing, turned the right of the enemy. He was subsequently employed to dislodge the enemy from their posts in front of Seringapatam, and after the capture of that capital he was appointed, July, 1799, to its command. From the moment of his arrival in India he had spared no pains to acquaint himself with its social and political position, and he now had the opportunity to turn his knowledge to account. For a considerable period he was occupied with nearly independent authority in organizing the government, both civil and military, of Mysor. During his administration he was compelled to take up arms against Dhoondia Waugh, a robber chief, who styled himself King of the Two Worlds. After a tedious and harassing pursuit he overtook and routed him with a small body of cavalry on 10th September, 1800. In December he was appointed to command a body of troops assembled at Trincomalee for foreign service. On receipt of advices from home at Madras that 3000 men were wanted for Egypt he took upon

himself the responsibility of embarking this army, without instructions, for Bombay; a daring proceeding, which was questioned, but not disapproved of, by the governor-general. On his arrival at Bombay he was seized with fever, and being unable to accompany the expedition to Egypt he returned to his government at Mysor. In April, 1802, he attained the rank of major-general. Early in 1803 he was appointed to the command of a force destined to restore the Peishwa of the Mahrattas, driven from his capital by Holkar. After this operation had been successfully performed the other Mahratta chiefs, Scindia and the Rajah of Berar, showed hostile designs against the British, and Wellesley was appointed to the chief military and political command in the operations against them. After an active campaign, in which he took Ahmednuggur and Arungabad, he encountered a powerful Mahratta army, assisted by French officers, at Assaye, on 23d September, and entirely defeated it. The parallel successes of General Lake, and the defeat of the Rajah of Berar by Wellesley at Argaum on 29th November, compelled the submission of the Mahrattas, and peace was restored on conditions drawn up by the successful general. Wellesley was immediately compelled to cross the Godavery to put down the freebooters, who, after an Indian war, pick up the disbanded soldiers and employ them in wasting and ravaging the country. In this fatiguing operation he was entirely successful. The fame of Wellesley's achievements had now spread over India. The inhabitants of Bombay presented him with an address, in which he was styled a commander equally great in the cabinet as in the field; from Calcutta he received a sword valued at £1000; from the officers of the Deccan a service of plate of the value of £2000; the native inhabitants of Seringapatam also presenting him with a touching address. In July he returned to Calcutta to confer on military affairs. His services and those of his brother were treated with some ingratitude by the Company, whose territories they had contributed vastly to increase, and his health failing he obtained leave to return home. Before leaving Madras he received his appointment as Knight Commander of the Bath and the thanks of both houses of Parliament. He sailed for England on 10th March, 1805, and arrived in September.

From November to February he was engaged as brigadier-general in Lord Cathcart's expedition to the Continent, which was without result. In January, 1806, he succeeded Lord Cornwallis as colonel of his own regiment, the 33d. On his return to England he was appointed to command a brigade for the protection of the coast at Hastings. On 10th April, 1806, he married Lady Catherine Pakenham, third daughter of the Earl of Longford. He had previously been elected M.P. for Rye, and distinguished himself in the House of Commons by the defence of his brother's administration in India. In April, 1807, he was appointed chief secretary for Ireland, and in August he received the command of the reserve in the expedition to Copenhagen under Lord Cathcart and Admiral Gambier. He took Kioge 29th April, the only land operation of importance. On returning he resumed his duties as secretary, and received the thanks of Parliament for his share in the expedition. On 25th April, 1808, he attained the rank of lieutenant-general.

The resistance of Spain and Portugal to the French yoke had inspired the British government with the fortunate resolution to employ the small land force which they were able to raise for continental operations chiefly in support of these efforts of patriotism. In June Wellesley received the command of a force destined to operate in the north of Spain and Por-

ugal. The expedition was about 10,000 strong, and other 10,000 were intended to follow. On 20th July he landed at Coruña, but as the Spaniards were indisposed to accept assistance except in means he sailed to Oporto, which he found in possession of the Portuguese insurgents under the Bishop of Oporto. On 30th July he brought the expedition to anchor in Mondego Bay, and landed his troops at Figueira. Here he was joined in a few days by General Spencer with 4000 men from Cadiz. Junot held Lisbon, which was the object of Sir Arthur's expedition, with about an equal force, after deducting garrisons, and the success of the Spanish insurgents had for the mean time cut him off from communication with Spain. The English commenced their southward march on 8th August, and at Leiria were joined by a small Portuguese force. Wellesley moved on the coast road to Torres Vedras. At Roliça he encountered about 5000 men under Delaborde, whom Junot had sent in advance to arrest his progress. This corps, after a spirited resistance, was driven back and retired to Torres Vedras. Wellesley now drew nearer the coast, reaching Vimeiro on the 19th, where he was reinforced by two brigades from England, raising his force to 17,000. At the same time he was superseded in the command. The government had determined to increase their army in the Peninsula, and had appointed Sir Hew Dalrymple to the chief command, with Sir Harry Burrard as second, and Wellesley, Moore, Hope, Paget, and Fraser as divisional commanders. Sir Harry Burrard had arrived from England, and Wellesley submitted to him his plan for pushing on to Lisbon, but Sir Harry did not approve of making a decided movement before the arrival of Sir John Moore's corps, which was expected. The question was speedily decided by Junot, who, having arrived at Torres Vedras with all his available force, determined to attack the English on the land side while they were in the immediate neighbourhood of the sea. The attack was made on 21st August. Sir Harry Burrard gallantly left to Wellesley the responsibility of defending his own position, but when Junot had been repulsed, apprehensive of the enemy's superiority in cavalry, he checked the pursuit, which would in all probability have led the British to Lisbon. After the battle Sir Hew Dalrymple arrived and took the command, and Junot proposed an armistice, the result of which was the famous Convention of Cintra, by which the French agreed to evacuate Portugal on condition of being conveyed to France with their arms and baggage. This agreement caused much discontent in England, where it was believed the French might have been compelled to lay down their arms as prisoners of war. Particular indignation was expressed at the latitude of a condition which permitted the French to carry away spoil as baggage. Wellesley had tried in vain to prevent this. Public feeling ran so high that the generals were recalled to be examined by a board of inquiry, but their conduct was approved of and commended. Wellesley proceeded to Ireland in December as chief secretary, and early in 1809 received the thanks of both houses of Parliament for his conduct of the campaign.

In the latter part of 1808 Napoleon overran Spain with 200,000 men, and Sir John Moore, pursued by Soult, carried the British army to Coruña, where it embarked for England. Lisbon was still held by Sir John Cradock, and a British force occupied Cadiz, when Wellesley was appointed to assume the chief command in the Peninsula. He arrived at Lisbon 22d April, 1809, and soon received reinforcements which enabled him, leaving a division for the defence of the line of the Tagus threatened by Victor,

to advance against Soult at Oporto with 24,000 men. Soult prepared to receive him on the line of the Douro, which was crossed by the British in face of the enemy, one division crossing into the town of Oporto itself. The French were thrown into confusion and retreated precipitately. Soult now retired to Galicia, followed by Wellesley to the frontiers of Portugal, and harassed by the insurgent Portuguese. The Peninsula was at this time occupied by about 250,000 French troops; but after the departure of Napoleon the independence or insubordination of the French marshals prevented effective co-operation of the different armies, and the French method of maintaining their armies at the expense of the country, and the recklessness of the subordinate agents by whom it was carried out, the violence and lust of the soldiers in their foraging parties, and the cupidity of their superiors, had roused the hatred of the country, so that the French command never extended beyond the districts occupied by their armies, and their stragglers in case of disaster were always liable to be massacred by the enraged inhabitants. The British commander had a different series of difficulties to contend with, which, as they extended through all his campaigns, and we cannot afford space to enlarge on them, may here be summarized once for all. First was the smallness of the armies on which he could rely. The numbers of the British were always comparatively insignificant, and reinforcements were slowly and scantily supplied. Almost as formidable was the difficulty of co-operating with his allies. Spain and Portugal were without regular governments. The Portuguese officers even had mostly fled to Brazil, but the Portuguese troops, carefully drilled by Beresford and placed under the command of British officers, soon became a tractable and efficient force. It was far otherwise with the Spaniards. The junta and the generals were alike ignorant, incompetent, and self-conceited, and with the raw levies which constituted the Spanish armies it was positively dangerous to co-operate. Even with the Portuguese government Wellington had natural but formidable difficulties to contend with. The subsistence of the armies was a constant source of danger and embarrassment both in Spain and Portugal. The resources of the country were oppressed by the armies of three nations. The French took all they wanted and wasted much more. The Spanish armies, numerous and inefficient, were a sufficient weight for the junta, which always supplied with reluctance the wants of the British, who had commonly much greater difficulty in procuring provisions for money than either of the other armies had in seizing them. Through all these difficulties Wellington adhered with undeviating patience and constancy to the strict principles of discipline he had laid down. He remonstrated with herculean labour, and with admirable spirit, as his despatches show, with authorities of all kinds; but he never under the greatest temptation took, or suffered others to take, violent means to supply his most pressing wants. To this conduct he adhered from policy as well as from principle. From the first he looked on the situation with the eye of a statesman as well as of a general, and counted surely on the reaction against lawless violence as a force in his favour; but it required more than policy to adhere to such a course amid necessities and dangers which might well have been urged to excuse, if not to justify a laxer practice.

By a misunderstanding between Soult, who held the command in the north of Spain, and Ney, who was under him, Galicia was evacuated by both marshals, and never afterwards recovered, a valuable result of Wellesley's first campaign. To co-operate with the Spanish armies, Wellesley had determined



to advance into Spain, which he did in July by the north of the Tagna. Joseph Bonaparte had about 60,000 men under Victor and Sebastiani for the defence of Central Spain. Soult, who held an independent command in the north, was at Zamora, and could bring up by concentration more than 50,000 men. The other French armies were more distant. Nearly every important fortress in Spain was in the hands of the French. General Cuesta, with about 40,000 men, was on the Guadiana, and another Spanish army under Venegas was to move on Madrid from the south. On the 20th Wellesley joined Cuesta at Oropesa. Victor had taken position at Talavera la Reina. Sir R. Wilson, with a detachment of Portuguese and Spanish troops, moved on to Escalona, threatening the French in their rear. On the 22d the allies drove in the outposts of the French, and Wellesley proposed to attack them next day before they were reinforced by Joseph and Sebastiani, but was frustrated by the perversity of Cuesta. The following day Victor fell back across the Alberche, where he was joined by King Joseph with Jourdan and Sebastiani. Nothing would now serve Cuesta but to attack them, and he advanced alone in spite of Wellesley's warnings, was rudely handled on the 28th, and compelled to fall back on the British. Next day Wellesley, expecting to be attacked in turn, took up his position at Talavera la Reina. As Soult and Ney were advancing from the north on Plasencia in his rear, he intrusted to Cuesta the charge of guarding the mountain pass of Puerto de Banos, a task which Cuesta thought proper to commit to 600 men. The advance of Venegas, who had reached Toledo, and the operations of Wilson near Madrid, induced Joseph to attack the English. Wellesley, who anticipated a battle, with great difficulty prevailed on Cuesta to fall back on Talavera. He placed the Spaniards on the right protected by the town and strongly entrenched, while the British on the left rested on a hill, the key of the position. While a demonstration was made against the Spaniards, thousands of whom fled as soon as attacked, the French gained the summit of the hill, and turned the British left. They were dislodged by General Hill, and the fighting closed for the day after dark. Next day the chief attack was directed on the British centre, which was broken; but Wellesley, who viewed the fight from the hill, had anticipated and provided for the crisis. As the broken regiments retired the 48th advanced from the British left, and opening its columns to let them pass closed again, and charged the pursuers. The guards and Germans who formed the centre rallied, and a light cavalry brigade advancing from the rear, the French gave way. This victory earned Wellesley the titles of Baron Douro and Viscount Wellington. Next day the French retreated across the Alberche, and broke up their army, Victor approaching Madrid to observe Wilson, and Joseph proceeding to Illescas to oppose Venegas. Wellington, leaving Cuesta in Talavera, turned to meet Soult. The position of the armies was now singular and almost unprecedented. The Portuguese frontier was guarded by Beresford at Almeida. Soult, Ney, and Mortier, with a force regarding which Wellesley was completely deceived, supposing it to be under 20,000 instead of over 50,000, were concentrating at Plasencia; the other armies were in the positions already mentioned. Although holding the central position, all the risk was run by Wellington, as no dependence could be placed on the Spaniards; and on ascertaining Soult's force from Cuesta, who abandoned Talavera and fell back on him, and finding that by his advance to Naval Moral, Soult had cut his communication with Portugal, he took the only remaining route which that marshal's

ignorance of his position left him, and crossing the Tagus at Arzobispo, placed himself on the high road to Badajoz. On 20th August he took up his headquarters at Badajoz, and cantoned his army on the Guadiana. The first invasion of Spain, which, if the state of the Spanish armies had been known, would perhaps not have been made, had resulted in nothing but a series of movements among the French troops. Wellington at this time surveyed the lines of Torres Vedras, and formed his plan of fortifications for their defence. (See TORRES VEDRAS.) After his departure the Spanish armies by their rashness exposed themselves to rout on all sides, and he anticipated the invasion of Portugal; but with the Portuguese forces and 80,000 British troops he advised his government that these lines could be held against 70,000 or 80,000 French, and a position preserved in the Peninsula available for future opportunities. Anticipating that the future invasion would come from the north, he left General Hill to guard the Tagus, and early in 1810 fixed his head-quarters at Visu.

The French in the meantime were largely reinforced. Soult was in Andalusia with 60,000 men threatening the south of Portugal, while in the north the army of Portugal was concentrating to the extent of 70,000 to 80,000, and the veteran Masséna was appointed to command it. Wellington was able to bring into the field from 50,000 to 60,000 British and Portuguese troops. The French invested the Spanish fortress of Ciudad Rodrigo early in June, and took it on 10th July. They then advanced to the Coa, from which the British retired. Almeida was captured on 27th August. Wellington fell back on the valley of the Mondego. In the middle of September Masséna began his march down the right bank of the river, the worst according to Wellington of many bad roads in Portugal. At the Sierra de Busaco, a high ridge in front of Coimbra, Wellington made a stand and repulsed the French. He had advised the Portuguese government to order the inhabitants to leave the open country and retire within the lines, carrying their effects and especially provisions with them, and this stand was intended to afford time for the evacuation of the country, and especially of Coimbra. After the battle Masséna turned Wellington's position, who retreated to Leiria, where he halted two days. On 8th October he entered his lines, just as the autumnal rains were beginning to fall. A powerful fleet and a flotilla of gun-boats on the Tagus contributed to their defence. Masséna was wholly unprepared for his reception, and after some vain demonstrations he retired from their front. The Portuguese parties had cut off his communications with Spain, and sickness was rapidly diminishing his numbers. On 15th November he fell back to Santarém, but the Portuguese on the left of the Tagus had neglected Wellington's instructions to clear the country. They had also left boats at Santarém, and the French using both banks of the river quartered their troops at ease in the principal towns. Napoleon recommended to waste the English with continual engagements of advanced guards, and sent Soult instructions to co-operate with Masséna. But Soult, with the blockade of Cadiz and with the Spaniards on his hands, could only spare a sufficient force to besiege Badajoz. In March, 1811, Masséna was compelled to begin his retreat, which he conducted with great skill but with still greater inhumanity, laying waste the country, and burning even the towns which had sheltered him, in mere revenge. Incessant skirmishing with the British light brigade and occasional combats of greater magnitude brought the French at length to the Agueda, which they crossed on 6th April. Wellington estimated their loss in the campaign at not less than 45,000. Well-



ton blockaded Almeida, and cantoning his army between the Coa and the Aguada, returned to Badajoz, which had been taken by Soult and invested by Beresford. He was speedily recalled by an aggressive movement of Masséna to relieve Almeida. Wellington took up a position to cover the fortress at Fuentes de Onoro, where he was attacked by Masséna with a superior force. In this battle he performed the exceedingly critical operation of changing his front in presence of the enemy. The manoeuvre was successful, and Masséna was repulsed. Almeida surrendered a few days after the battle, and Masséna was about the same time superseded by Marmont. Soult in the meantime had been defeated by Beresford at Albuera in an attempt to relieve Badajoz. Wellington returned to prosecute the siege, and Marmont also moved south to join Soult, but afterwards returned to Salamanca. This induced Wellington to push the siege of Ciudad Rodrigo in preference to that of Badajoz, and he returned to the Aguada. Marmont, however, advanced with a superior force, and he withdrew to the Coa. Marmont returned to Salamanca.

During winter Wellington continued to occupy himself with preparations for this siege, collecting his stores at Almeida under pretext of repairing it. On 6th January, 1812, he moved his head-quarters to Gallegos, invested Ciudad Rodrigo on the 8th, and took it by assault on the 12th. An earldom, a pension, and a Spanish dukedom rewarded this achievement. Wellington now went south with his principal force to take Badajoz; and Marmont, who had collected his forces to raise the siege of Ciudad Rodrigo, invaded Portugal by Sabugal, and ravaged the country. Badajoz was taken on 6th April, with a heavy loss, which broke the firmness of Wellington, and caused him a passionate burst of grief. Having secured the frontier fortresses Wellington determined again to invade Spain. Leaving Hill on the southern frontier he moved north with his main army, and on 17th June reached Salamanca, Marmont retiring to Toro. The French general, when he had concentrated his forces, attempted by a series of pretentious manoeuvres to surprise the British commander, his ultimate object being to cut him off from his communications. With this purpose he crossed the Tormes followed by Wellington, who took up his position between the river and two hills called the Arapiles. Here Marmont's over-display of tactics recoiled on himself. Having gained the outer Arapile, in extending his left to attack the British right he gave Wellington the opportunity he had long desired of attacking him. Marmont was wounded, and the French left and centre broken. Clausel, who attempted to re-form the army, was routed. Numerous prisoners were taken by the cavalry in pursuit, and the French retired to Burgos. Wellington reached Valladolid on 31st July, and turning on Joseph, who had advanced to support Marmont, followed him to Madrid, which he entered on 12th August. Hill was now advancing to join Wellington, and Joseph fell back from Toledo to Almansa in Murcia. These successes compelled Soult to abandon Andalusia, and an Anglo-Spanish force from Cadiz took Seville. Wellington's next movement was against the army he had defeated under Clausel, which had been largely reinforced. He left Hill in Madrid (1st September), and advanced to Burgos, being joined on his way by a body of Spaniards. The French retired, leaving a garrison in the castle, which Wellington deemed it necessary to take before advancing. The siege, for want of proper artillery, occupied him till 21st October. In the meantime the northern army under Souham was again advancing, and Soult with a powerful army marching on Madrid, which Hill had abandoned to

fall back on Salamanca. Wellington abandoned the siege and retreated, closely followed by the French, who repeatedly attacked his rear. At Palencia he was joined by a brigade from England. At Tudela Souham halted to wait for Soult, and Wellington proceeded to the Tormes, where he was joined by Hill, and when the French crossed the Tormes in force he took up his old position at the Arapiles. The united armies of Soult and Souham amounted to nearly 90,000 men. Wellington's strength was over 50,000. The enemy, instead of attacking, threatened his communications, upon which he retreated to the Aguada, and established his headquarters at Ciudad Rodrigo. The French, not being prepared to invade Portugal, withdrew their armies to cantonments in Castile. General Hill's corps continued to occupy Estremadura, and the rest of the British were cantoned on the Portuguese frontier.

The gains of this campaign were substantial. The French had not only been compelled to reinforce their Spanish armies largely at the expense of their operations elsewhere, but had lost Andalusia, and given the British a footing in Estremadura. The sufferings of the British troops on their retreat, which had been hasty and almost disorganized, had led to irregularities which were reprov'd by Wellington in a severe proclamation. He received (18th August) the title of marquis, and Parliament voted him thanks and £100,000. The failure of the Russian campaign compelled Napoleon to recall Soult from Spain, and Wellington was able to open the campaign of 1813 with a force of 70,000 British and Portuguese. He had also been appointed commander-in-chief of the Spanish armies. He opened the campaign in May by an advance in the former direction, and on 12th June reached Burgos, the French retreating to the Ebro. Wellington turned their position by crossing the Ebro near its source, and after some unsuccessful fighting they fell back on Vittoria. In a strong position commanding the principal roads through the town they were defeated by the British on 21st June. Being driven from the town, while the British left had seized the Bayonne road, by which they retreated, they were thrown into confusion and routed. The baggage of King Joseph and a marshal's baton fell into the hands of the victors. Wellington now occupied the passes of the Pyrenees, and besieged Pampluna and San Sebastian. He was created field-marshal and received the Spanish title of Duke of Vittoria. Soult was despatched by Napoleon, with the title of lieutenant of the emperor, to restore matters in the Peninsula. He had still a powerful army (80,000), but after a series of engagements, called the battles of the Pyrenees, he retreated into France. Some time being spent in pushing the sieges of Pampluna and San Sebastian, the former of which surrendered 31st August, the latter 31st October, Wellington crossed the Bidassoa in October, and in November the whole army descended from the Pyrenees into the French plains. Some severe fighting occurred before the armies went into winter cantonments. On 27th February Wellington defeated Soult at Orthez, and the French retreated to Toulouse. Suchet had abandoned Catalonia, and reached Narbonne. Another engagement took place in front of Toulouse on 10th April, in which the French after severe fighting were driven into the town. Next day Soult evacuated Toulouse, and Wellington entered it on the 12th. In the afternoon news arrived of Napoleon's abdication, but Soult declined to submit to the provisional government without further advice, and Wellington refused an armistice. Advice having arrived from Berthier, Soult entered into a convention on 18th, and Suchet on 19th April. In a sort of the garrison of Bayonne, before the peace was known,

the British suffered severely. On 30th April Wellington, leaving his army in quarters, set out for Paris. In May he had to visit Madrid to allay political differences among the Spanish generals, and on 14th June he issued farewell orders to his army. He was created Marquis of Douro and Duke of Wellington in May, with an annuity of £13,000, commutable for £300,000, afterwards £400,000. He received the thanks of both Houses of Parliament. In July he went as ambassador to France, and he succeeded Lord Castlereagh as British representative in the Congress of Vienna. In April he took the command of the army assembled in the Netherlands to oppose Napoleon. (See FRANCE and WATERLOO.) On his return to England after the restoration of peace he received a vote of £200,000 for the purchase of the estate of Strathfieldsaye, to be held on presenting a coloured flag at Windsor on the 18th of June each year. Numerous foreign honours were showered upon him; among others he was made field-marshal of the armies of France, Russia, Austria, and Prussia.

With the return of peace he resumed the career of politics. He accepted the post of master-general of the ordnance with a seat in the cabinet of Lord Liverpool in January, 1819. In 1822 he represented Great Britain in the Congress of Vienna. In 1826 he was appointed High-constable of the Tower. This year he went to St. Petersburg as ambassador on the affairs of Greece. On 22nd Jan. 1827 he succeeded the Duke of York as commander-in-chief of the forces. On the accession of Canning to office (April, 1828) he set the bad example of resigning this post on political grounds. He resumed it again on the accession of Lord Goderich. On 8th January, 1828, he accepted the premiership, and, resigning the command of the forces, gave it to Lord Hill. During his first year of office he carried the repeal of the Test and Corporation Acts. In January, 1829, he was appointed Governor of Dover Castle and Lord Warden of the Cinque Ports. This year he carried the Catholic Emancipation Bill. Both this and the repeal of tests were reforms which he had steadfastly opposed, and which he yielded to necessity rather than conviction. He fought a duel in defence of his conduct on this bill with Lord Winchelsea on 21st March. In 1830 repeated motions for parliamentary reform were defeated, but the growing discontent throughout the country on this subject and a defeat in Parliament caused the resignation of the government in November. His opposition to reform made the duke so unpopular that he was assaulted by the mob on 18th June, 1832, and his life endangered. He accepted the office of foreign secretary under Sir Robert Peel, 9th December, 1834, and retired with him, 8th April, 1835. In the Peel ministry in 1841 he took a seat in the cabinet without office. On 10th December, 1842, on the death of Lord Hill, he resumed the command of the forces, which he held till his death. On the return of Peel to office in 1846 he supported him in carrying the repeal of the corn-laws, which up till then he had opposed. From this time his general policy in Parliament was to support the government of the day. He died at Walmer Castle, 14th September, 1852. His despatches have been published in three series, namely, Despatches, 1799–1815, edited by his private secretary, Col. Gurwood (thirteen vols., 1834–39; 2nd ed., eight vols., 1844–47); Supplementary Despatches and Memoranda, 1794–1818, edited by his son (fifteen vols., 1858–72); and Civil and Political Despatches, 1819–32, edited by his son (eight vols., 1867–80). Selections from his despatches have also been published. Two volumes of his parliamentary speeches appeared in 1854. The most complete biography is that of Rev. G. R. Gleig (four vols.,

1858–60; later abridged editions), and among others are those of G. N. Wright, W. H. Maxwell, C. D. Yonge, and G. Hooper. See also A. Griffiths's *Wellington and Waterloo*; E. B. Hamley's *Wellington's Career*; Lord Roberts's *Rise of Wellington*; Napier's *History of the Peninsular War*; Ropes's *Campaign of Waterloo*; Oman's *History of the Peninsular War* (vol. i., 1902); &c.

WELLS, a city and municipal borough of England, in Somerset, at the foot of the Mendip Hills, 20 miles south-west of Bath. It is a well-built town of considerable antiquity, and owes its interest mainly to its venerable cathedral and its ecclesiastical associations. The oldest parts of the present structure date from the first half of the thirteenth century, notably the beautiful western front (restored 1873). The neighbouring deanery is a building of the fifteenth century, and the vicars' college contains work of various dates from the thirteenth to the fifteenth century. The Bishop's Palace is in the style of an old baronial castle, and has an ancient chapel in the Decorated style. The church of St. Cuthbert is, in its present form, mainly a fourteenth-century building. There are various other places of worship; a town-hall (1779); market-house; grammar-school, founded, it is said, in the thirteenth century; a blue-coat school (1654), re-organized in 1889; a theological college; the county lunatic asylum, situated outside the city; almshouses; &c. Brushes and paper are the principal manufactures. Wells is named from some springs in the vicinity, and contributes to the name of the see of Bath and Wells. From 1295 till 1868 it sent two members to parliament, but in the latter year its representation was merged in that of the county. Pop. in 1891, 4822; in 1901, 4849.

WELLS, CHARLES JEREMIAH, English poet, was born about 1800 in or near London. He was educated in a school kept by Charles Cowden Clarke at Edmonton, and was a school-fellow of a younger brother of John Keats, with whom and with Leigh Hunt and Hazlitt he was intimately associated. He became a solicitor. His *Stories after Nature* was published anonymously in 1822, but attracted little attention until W. J. Linton reprinted some of them in 1845. In 1823 Wells published under a pseudonym his fine dramatic poem, *Joseph and his Brethren*. It was even more completely ignored than his earlier prose work, but in recent years it has been recognized by good judges as a work of great merit. He went to Brittany in 1840 and became professor of English in a college at Quimper. He died at Marseilles on Feb. 17, 1879. In 1876 Mr. Buxton Forman produced a new edition of *Joseph and his Brethren*, to which Mr. Swinburne contributed a preface; and in 1891 Mr. Linton issued a new edition of his *Stories after Nature*.

WELSH ONION. See CIBOL in SUPP.

WELSHPOOL, a municipal and parliamentary borough of Wales, regarded as the county town of Montgomeryshire, being the seat of the assizes and county courts, near the left bank of the river Severn, 17 miles west by south of Shrewsbury. The chief buildings are the fine Gothic church of St. Mary's (restored in 1871), the town-hall (including assize courts, &c.), the county intermediate schools, the Powysland Museum, and the public library. The manufacture of woollens is the chief industry. Powis Castle is near the town, which belongs to the Montgomery district of boroughs. Pop. in 1891, 6501; in 1901, 6121.

WELWITSCHIA, a genus of plants of the order Gnetaceae, in the division of Gymnosperms, containing only one species, *W. mirabilis*. This species is confined to the deserts of German South-west Africa,

where it was discovered in 1860 by a German named Welwitsch. It has a short and more or less conical stem of great circumference, which extends only about 4 inches above the ground, and from its top a pair of large opposite leaves spread out. These leaves last throughout the whole lifetime of the plant, and become ultimately torn up longitudinally into long strips, which trail on the surface of the ground. They were formerly regarded as the cotyledons of the plant, but it is now known that the cotyledons are two short-lived leaves of much smaller size which precede them. The flowers of the plant grow in cones like those of many conifers, the cones being arranged in panicles on the end of the stem between the two leaves. The female cones are much larger than the male ones, and in fruit are of a scarlet colour.

WEN, an encysted tumour found on the scalp or other parts of the body. These tumours are comprehended in a membrane called a *cyst*, which contains a fluid matter. The causes of the formation are unknown, but a strongly-marked tendency to such swellings exists in particular individuals, which leads to the suspicion of constitutional causes. An encysted tumour, in its commencement, is always exceedingly small and perfectly indolent; and it is often many years before it attains a considerable size. These swellings are usually spherical, except when this form is altered by the disposition of the surrounding parts. The best mode of treatment is amputation of the whole swelling.

WENCHOW, a treaty port of the Chinese Empire, in the province of Chekiang, on the estuary of the Ta-kai river, about 200 miles south by west of Shanghai. Ruined palaces, gates, and triumphal arches are among the numerous signs of its vanished greatness, but it is still a comparatively clean town, with broad streets. Among buildings of recent erection are the custom-house and the branch of the Imperial Chinese Post-office. The chief imports are cottons, kerosene, sugar, opium, iron, and woollens; and the principal articles of export are tea, umbrellas, timber, and oranges. The average annual values of the imports and exports during several recent years were about £170,000 and £58,000 respectively. The tonnage of shipping entered in 1901 was 26,044, of which very little was British. There is also a considerable junk trade. Pop. about 80,000.

WENDOVER, a market-town of England, in Buckinghamshire, 20 miles N.W. of Windsor, with a Decorated church (restored), Nonconformist chapels, a literary institution, a market-house, &c. It was a two-member parliamentary borough from 1300 till 1832. Pop. in 1891, 2036.

WENDS, among the old German peoples a general designation for their Slavonic neighbours, now restricted to the Slavic people of Upper and Lower Lusatia, who call themselves Serbs (*Serbo*), whence the name Sorbs, often applied to them by German authorities. In the earliest historical times the Sorbs occupied the country from the Saale to the Bober, and from the latitude of Berlin south to the Erzgebirge; but the Wends are now confined to a small territory (about 1270 square miles) in the upper Spree valley, extending from south of Bautzen to north of Kottbus. The larger part of this Wendish region belongs to the Prussian provinces of Brandenburg and Silesia, the smaller southern part being included in the kingdom of Saxony (circle of Bautzen). The Wends are completely surrounded by Germans, and being thus cut off from contact with the other Slavs, they are becoming slowly Germanized. Their language, known as Sorbian, falls into two dialects, Upper and Lower Sorbian, which are spoken in the south and the north of the territory respectively. The total number of Wends is

about 120,000, of whom about 50,000 live in Saxony and 70,000 in Prussia. About 12,000 are Roman Catholics, the remainder being chiefly Lutherans. Till about the middle of the nineteenth century Sorbian literature consisted almost wholly of ecclesiastical and religious works, and works relating to the needs of peasant life, but there has since been a revival of national feeling, accompanied by a more extended literature.

WENER, the largest lake of Sweden, and after those of Ladoga and Onega the largest in Europe, situated centrally between the läns of Wermland, Dalsland, and Wester Götland. It is 147 feet above sea-level, and of very irregular shape. Its greatest length, north-east to south-west, is about 100 miles; and its breadth may average about 30 miles, though at the widest it is not less than 50 miles, and in its lower part, where two peninsulas stretch far into it from opposite directions, it is not more than 15 miles. This distance is still further narrowed by a group of small islands, and hence the part of the lake above these peninsulas is sometimes considered as Wener proper, while the part below is called Lake Dalbo. The area covered by both is 2242 square miles. By far the most important feeder is the Klar-elf, which pours in at its north end the accumulated water of a course of more than 250 miles. Its only proper outlet is at Wenersborg at its south-western extremity, where its superfluous waters are received by the Göta-elf. In summer steamers and other vessels ply regularly upon the lake; in winter it is frozen for several months, and crossed by sledges. It abounds with fish, particularly trout. The Göta-Canal connects Lake Wener with Lake Wetter, and the Dalsland Canal connects it with Fredrikshald in Norway.

WENLOCK, a municipal borough of England, in Shropshire, 12 miles south-east of Shrewsbury. It is in general well built of brick; and has an ancient church (restored) with a square tower and a spire; several Dissenting chapels; an ancient guild-hall; a modern market-hall; a corn-exchange; and the ruins of an ancient priory. In 1885 it ceased to be a parliamentary borough. Pop. in 1891, 15,703; in 1901, 15,866.

WENTLETRAP. See SCALARIA.

WENTWORTH, SIR THOMAS, Earl of Strafford. See STRAFFORD.

WERDAU, a town of Saxony in the circle of Zwickau, on the river Pleisse, 25 miles W.S.W. of Chemnitz. It has extensive manufactures of woollen and linen cloth, worsted, shoes, machinery, &c. There are also paper and dye works. Pop. in 1895, 17,358; in 1900, 19,355.

WERDEN, a town of Rhenish Prussia, on the river Ruhr, here crossed by a bridge with statues of the Emperor William I., Bismarck, and Moltke, 15 miles north-east of Düsseldorf. Its ancient abbey is now transformed into a house of correction. There are manufactures of woollen and cotton cloth, paper, leather, &c.; and coal mining is carried on in the vicinity. Pop. in 1895, 9413.

WEREWOLF, a man-wolf, a man transformed into a wolf according to a superstition prevalent in ancient and mediæval times. See LYCANTHROPY.

WERFF, ADRIAAN VAN DER, a Dutch painter, born near Rotterdam, in 1659, of poor parents, was first instructed in his art by Piccoletti, a portrait-painter, and afterwards became a pupil of Van der Neer. He settled at Rotterdam, and in 1696 was fortunate enough to attract the notice of the Elector Palatine, who was thenceforward his liberal patron, and who ennobled him in 1703. Among his celebrated paintings are the Judgment of Solomon; Christ carried to the Sepulchre; Ecce Homo;

Abraham with Sarah and Hagar; and Magdalen in the Wilderness. He died at Rotterdam, Nov. 12, 1722. Van der Werff was particularly noted for his small historical pieces, which are most exquisitely finished, and which are still in high request.—His brother and pupil, PIETER VAN DER WERFF (1665–1721), painted portraits and domestic pieces.

WERGILD, or WERGILD, among the Anglo-Saxons the fine which was payable, by a person who had killed another, to the kinsmen of the person killed. See ANGLO-SAXONS.

WERNER, ABRAHAM GOTTLIEB, a German mineralogist, born near Bunzlau on September 25, 1750. He was educated partly at Bunzlau, partly at the Mining Academy at Freiberg. Thence he removed to Leipzig, where he applied himself to natural history and jurisprudence, especially the former. In 1775 he was appointed inspector and teacher of mineralogy and mining in the Mining Academy at Freiberg, in which position he remained for the rest of his life. He contributed a number of valuable articles to various periodicals, and wrote several works on mineralogy. Werner was the first to separate geology from mineralogy, and to place the former on the basis of observation and experience. The geological theory with which his name is connected is that which attributes the phenomena exhibited by the crust of the earth to the action of water, and is known as the Wernerian or Neptunian theory, in contradistinction to the Huttonian or Plutonic, in which fire plays the chief part. He was nominated counsellor of the mines of Saxony in 1792, and had a great share in the direction of the Academy of Mining, and in the administration of public works. The cabinet of minerals which he had collected was unrivalled for its completeness and arrangement, consisting of 100,000 specimens. It was acquired by the Academy. He died unmarried at Dresden on June 30, 1817.

WERNER, FRIEDRICH LUDWIG ZACHARIAS, German dramatist, was born at Königsberg on Nov. 18, 1768. After studying jurisprudence and cameralistic science and attending Kant's lectures in his native town, he became in 1793 chamber secretary in the Prussian service, in which capacity he spent some years in Warsaw. In 1805 he obtained a government post in Berlin, but two years later he retired from the public service and travelled abroad. He made the acquaintance of Goethe at Weimar and of Madame de Staël at Coppet, and in 1811 he went to Rome. In the latter year he joined the Roman Catholic Church, and in 1814 he was consecrated priest at Aschaffenburg. Taking up his residence in Vienna, he preached with great acceptance. In 1816–17 he lived in Podolia with Count Choloniowski, through whose influence he was appointed head of the chapter of the cathedral of Kaminiac. The last years of his life were spent in Vienna, where he died on Jan. 17, 1823. Werner's dramatic works reveal much of the power and pathos characteristic of Schiller, but overlaid to a constantly increasing extent, as he advanced in years, by mystical and undramatic elements. The chief of them are: *Die Söhne des Thals* (1804); *Das Kreuz an der Ostsee* (1806); *Martin Luther oder die Weihe der Kraft* (1807); *Attila* (1808); *Wanda* (1810); *Die Weihe der Unkraft* (1813), a sort of retraction of the earlier play on Luther; *Kunigunde die Heilige* (1815); *Der 24. Februar* (1815); and *Die Mutter der Makabäer* (1820).

WERNIGERODE, a town of Prussia, in the province of Saxony and government of Magdeburg, 43 miles south-west of the city of that name, on the Holzemme, at the foot of the Harz Mountains. It has a castellated residence of the Princes of Stol-

berg-Wernigerode, with a library of over 100,000 volumes, an excellent natural history cabinet, and collection of animals; a gymnasium and other higher schools; a fine town-hall; and a Prince Otto museum. There are manufactures of iron, machinery, chocolate, cigars, dye-stuffs, &c. Pop. in 1895, 10,480.

WESEL, a town of Germany, in the Rhine province of Prussia, on the right bank of the Rhine, at the mouth of the river Lippe, 85 miles north by west of Düsseldorf. The Rhine is here crossed by a railway and a pontoon bridge, and the Lippe by a railway and two other bridges. The Berlin gate, with statues of Hercules and Minerva, dates from 1722. The principal church was founded in the twelfth century, and dates in its present form from 1521. It was restored in 1883–96. The town-hall, with a Gothic façade, was completed in 1390. The other buildings and institutions include the Lower Rhine Museum, formerly a French church; the artillery barracks, formerly a Dominican monastery; a royal gymnasium and other higher educational institutions; two hospitals; an orphanage; and the fortress prison. Soap, wire, and cement are manufactured, and there are also sugar-refineries, brick-works, flour and oil mills, steam saw-mills, &c., besides a trade in timber, grain, &c. Wesel has ample harbour and quay accommodation. The fortifications were demolished in 1890, except the citadel and four outer forts, one of which, Fort Blücher, is on the left bank of the Rhine. Wesel can be traced back to the eighth century. It was a member of the Hanseatic League, and adopted the Reformation in 1540. It came into Prussian possession in 1814. Pop. in 1895, 22,259; in 1900, 22,547.

WESER (Latin, *Visurgis*), a river of Germany, formed by the junction of the Fulda and Werra at Münden, between the provinces of Hanover and Hesse-Nassau, flows very circuitously first north-west, then N.N.E., between Westphalia and Brunswick, past the towns of Hörter and Holzminden, and W.N.W. past Hameln and Rinteln; below the latter it enters the government of Minden; flows north past Minden into Hanover; turns W.N.W., traverses the town and the territory of Bremen, forms the boundary between Hanover and Oldenburg, at Elsfleth turns almost due north, and falls by a wide mouth, very much encumbered with sandbanks, into the German Ocean. Its whole course is about 430 miles. It is navigable by barges to some distance up both head-streams, but the practical limit of summer navigation is Hameln. The lower part, from Bremen to Bremerhaven, has been deepened and improved for large vessels.

WESLEY, CHARLES, younger brother of John Wesley, born at Epworth, December 18, 1707, was educated at Westminister School, and Christ Church, Oxford, where he graduated Master of Arts in 1733. While he was at college, Garrett Wesley of Dangan offered to make him his heir, provided he would leave Oxford and settle in Ireland. The offer was declined, and Richard Colley, cousin of Garrett Wesley, and father of the first Earl of Mornington (who was father of the Duke of Wellington), succeeded to the Dangan estate. Charles accompanied his brother to Georgia, and also became a preacher in the Methodist body, being for many years an itinerant evangelist, but he differed from his brother on some doctrinal and other points. After residing for some years at Bristol and Bath he came to London in 1771, and here he died on 29th March, 1788. He is said to have written 6500 hymns, of which many are well-known. (See next article.) Two of his sons, Charles and Samuel, were celebrated for musical genius, the latter especially, who was the greatest organist of his day.

**WESLEY, JOHN**, the systematic founder of Wesleyan Methodism, was a younger son of the Rev. Samuel Wesley, of Epworth. The name Wesley is the same as Wellesley, and the Wesleys belonged to the same family as the Duke of Wellington, who originally wrote his name Wesley. (See preceding article.) John Wesley was born 17th June, 1703, and was educated at the Charterhouse, and at Christ Church, Oxford. He took the degree of B.A. in 1724, was ordained deacon in 1725, became a fellow of Lincoln College, in which he was appointed Greek lecturer and moderator, and in 1727 graduated M.A. He was of a serious and religious turn of mind, and books which impressed him powerfully were the *Imitatio Christi* and Taylor's *Holy Living and Holy Dying*. He took priest's orders in 1728. About the close of 1729 he was called from acting as his father's curate to perform the duties of his fellowship in person. At Oxford he found an association of students of which his brother Charles was a member. It was known by various nicknames, among which were the Holy Club, the Bible Moths, the Sacramentarians, and the Methodists. It appears that all the association did at this time to earn these opprobrious epithets was to meet on Sunday evenings to read the Scriptures, and on other evenings to read secular literature. John Wesley joined this society, which gradually became exclusively religious in its object, and highly ascetic in its tone. Its members fasted twice, and communicated once a week, visited prisons and the sick, and engaged frequently in prayer, meditation, and self-examination. Among the members were Hervey and Whitefield. At the time John Wesley joined it the society numbered very few members, but it gradually increased, though it never became a numerous body. This induced him to decline his father's living at Epworth, that he might continue to exercise his influence at the university. During his residence at the university he became acquainted with Law, the author of the *Serious Call to the Unconverted*, whose society exercised much influence over him. In 1735 he accepted an invitation from General Oglethorpe to go out to America to preach to the colonists of Georgia. He sailed on 10th December, along with his brother Charles and a considerable body of Moravians. During his visit to the colony he paid his addresses to Sophia Hopkey, niece of the chief magistrate of Savannah, or rather, as the story is told, received her advances with favour, but ultimately declined to marry her. Miss Hopkey married a Mr. Williamson, and Wesley, without assigning a reason, refused to admit her to the communion. Her husband threatened legal proceedings, which were not enforced, but Wesley, on account of this event, left the colony, 'shaking the dust from his feet'. He reached England 1st February, 1738, just as Whitefield, under whose preaching Methodism had made great progress, sailed for Georgia. At this time an important event took place in the inner religious life of Wesley. He was converted, according to his own account, about a quarter to nine o'clock on the evening of 24th May, 1738, at a meeting to which he had gone very unwillingly, while Luther's Preface to the Epistle to the Romans was being read. On 13th June he set out for Germany to visit Herrnhut. He met Count Zinzendorf at Marienborn, stayed a fortnight at Herrnhut, and returned to England about the middle of September. Whitefield returned from Georgia about the end of the year, and became intimately associated with Wesley. He began open-air preaching near Bristol in the following February, and his example was soon followed

by Wesley. In July, 1740, Wesley separated from the Moravians, on account of doctrinal differences. He soon after separated from Whitefield, but without a permanent personal breach. Wesley had now the sole control of the religious body which adhered to him, and he devoted his entire life without intermission to the work of its organization, in which he showed much practical skill and admirable method. His labours as an itinerant preacher were incessant. He had no permanent residence, and never intermitted his journeys on account of the weather. He would ride from 40 to 60 miles in a day. He read or wrote during his journeys, and he frequently preached four or five times a day or oftener. He married in 1750 Mrs. Vazeille, a widow with four children, but his habits of life, which he did not attempt to accommodate to his wife, produced an alienation, and they finally separated. He died 2nd March, 1791. Wesley held strongly to the principle of Episcopacy, though not a believer in the apostolic succession; and he never formally separated from the Church of England. His collected works were published by himself in 1771-74 in thirty-two volumes 12mo. But in these only a part of his literary output was included, his publications being of the most miscellaneous character, including grammars, an English dictionary, biographies, manuals of history, logic, medicine, which together brought him in large sums of money. In 1780 he commenced a monthly magazine, the *Arminian Magazine*, which he edited during his life, and which after his death was merged in the *Methodist Magazine*. He also wrote many hymns, which are included in the *Poetical Works of John and Charles Wesley*, 1868-72 (thirteen vols.). See *Green's Bibliography of the Works of John and Charles Wesley* (1896). For the life of Wesley see his own journals and correspondence, and *Lives by Whitehead* (1791-93), *Moore* (1824-25), *Southey* (1820), *Tyerman* (1870-71), *Rigg* (1875), *Green* (1881), and *Overton* (1891). See **METHODISTS**.

**WESSEX**, that is, **WEST SAXONS**, one of the most important of the kingdoms of the so-called Saxon heptarchy in England, during the sixth, seventh, and eighth centuries, and the early part of the ninth, and that in which the other kingdoms were ultimately merged in the reign of Egbert in 827. See **EGBERT** and **ENGLAND**.

**WEST, BENJAMIN**, painter, was born at Springfield, Pennsylvania, 10th October, 1738. He showed great precocity in his aptitude for painting. At the age of eighteen he established himself as a portrait-painter at Philadelphia, and subsequently followed the same profession in New York. In July, 1760, he visited Rome, from whence he proceeded to Florence, Bologna, Venice, and Parma. Returning to Rome he painted Cimon and Iphigenia and Angelica and Medora. He was elected member of the Academies of Florence, Bologna, and Parma, which acquired him some reputation. He visited England in 1763, and was so well patronized that he determined to make it his future residence. He painted Hector and Andromache, The Return of the Prodigal Son, and a historical painting of Agrippina, the last for the Archbishop of York, who introduced him to George III. The king became his steadfast patron, and gave him commissions to the extent of about £1000 a year for upwards of thirty years. In painting the Death of General Wolfe, West departed from the custom of the artists of the day of giving the characters Greek or Roman costumes. He painted a series of historical works for Windsor, and for the chapel a series on the progress of revealed religion, divided into four series, antediluvian, patriarchal, Mosaic, and prophetic. On the death of

Reynolds, in 1792, he was unanimously elected President of the Royal Academy. When George III. became insane the order for painting the religious series was abruptly recalled and the pay stopped. West had finished twenty-eight pictures, and sketched the entire series. He afterwards painted a number of religious and historical pictures on very large canvases. Among them may be noticed Christ Healing the Sick (in the National Gallery), the Crucifixion, Ascension, and Death on the Pale Horse. The Battle of La Hogue is among the best of his historical pieces. He died 11th March, 1820. West's pictures number about 400.

**WEST BROMWICH**, a municipal, parliamentary, and county borough of England, in Staffordshire, between Wednesbury and Birmingham. The principal buildings include the town-hall (1874-75) with a massive tower; a number of fine modern churches; several chapels of different denominations; public schools; an institute, art and technical schools, a free library, and a hospital. There is a fine public park. West Bromwich has a share in the mining and manufacturing industries of this busy district, and has grown largely of late years, carrying on the manufacture of iron goods of various kinds, smelting, brass-founding, &c. It became a municipal borough in 1882, and a county borough in 1888. Since the passing of the Redistribution Act of 1885 it has sent one member to Parliament, being previously included in Wednesbury. Pop. in 1881, 56,295; in 1891, 59,474; in 1901, 65,172.

**WESTBURY**, a town of England, in Wiltshire, on the edge of Salisbury Plain, 11 miles south-east of Bath. It has manufactures of woollens, gloves, bricks, &c. It ceased to be a parl. bor. in 1885. Pop. (1891), 4439; (1901), 3300.

**WESTERN AUSTRALIA**. See **AUSTRALIA**.

**WESTERN EMPIRE**. See **ROME**.

**WESTERN ISLANDS**. See **HEBRIDES** and **AZORES**.

**WEST HAM**. See **HAM (WEST)**.

**WEST INDIES** (also called the **ANTILLES**), the extensive archipelago or series of islands which lies between North and South America, stretching from the coast of Florida to the shores of Venezuela. It is divided by geographers into the Bahamas, a group stretching from near the coast of Florida, in a southeasterly direction; the Greater Antilles, comprising the four largest islands of the group, Cuba, Hayti, Porto Rico, and Jamaica; the Lesser Antilles, stretching like a great bow, with its convexity towards the east, from Trinidad, near the coast of Venezuela, to Porto Rico, and subdivided into the three groups known under the name of the Windward Islands, the Leeward Islands, and the Virgin Islands. Each of the divisions above mentioned, and the most important individual islands, are described separately. The islands stretching along the north coast of South America, and those on the coast of Central America, form two additional groups. The whole archipelago, with the exception of some of the Bahamas, lies within the torrid zone. The total area does not exceed 95,000 square miles, of which the Greater Antilles occupy nearly 83,000 square miles. The name *Indies* was given to the islands because Columbus (who first discovered them in 1492) was under the notion that they formed part of India, which was the object of his search. When the mistake was discovered they retained the name, with the prefix *West*, to denote their geographical position. (See **AMERICA** and **COLUMBUS**.) Some of the Lesser Antilles are flat, but the general character of the West Indian Islands is bold and mountainous. Volcanic action is confined in the archipelago to the smaller islands,

from Grenada to St. Eustatius. Hayti and Jamaica have been the scenes of some of the most tremendous earthquakes on record, and the recent volcanic eruptions on Martinique and St. Vincent are still fresh in public memory. In the interval between June and October the islands are often visited by tremendous hurricanes. The climate in the Antilles is extremely hot, but the length of the night, the sea-breezes, and in many of them the elevation of the land, tend to modify the sun's influence. The islands abound generally in all tropical productions, as sugar, cotton, coffee, indigo, pimento, cocoa, medicinal drugs, tobacco, maize, guava, plantain, cacao, &c.; bananas, oranges, lemons, limes, citrons, pine-apples, &c.; manioc, yams, potatoes, &c. There are many varieties of trees, adapted for cabinet-work, ship-building, and other purposes, such as cedars, mahogany, lignum-vitæ, iron-wood, the Indian fig-tree, the calabash-tree, &c. At the time of their discovery the southern islands of this archipelago were inhabited by a fierce and warlike race called Caribs; the northern by a gentler race, the Arrowauks. Both, with the exception of a few hundred Caribs in Dominica, are now extinct. The following is a list of the West Indian islands grouped according to the states to which they now belong:—

*United States:* Cuba (independent under the suzerainty of the States), Isle of Pines, Porto Rico, in the Greater Antilles.

*British:* Jamaica, Cayman Brac, Little Cayman, Great Cayman, in the Greater Antilles; Barbados, Grenada, Grenadines, St. Lucia, St. Vincent, Trinidad, Tobago, in the Windward group; Anguilla, Antigua, Barbuda, St. Kitt's, Dominica, Montserrat, Nevis, in the Leeward group; Anegada, Tortola, Virgin Gorda, in the Virgin group; all the Bahamas and the islands off the coast of British Honduras.

*Danish:* St. Thomas, St. Croix (Santa Cruz), and St. John, in the Virgin group.

*Dutch:* St. Eustatius, Saba, and St. Martin (partly French), in the Leeward group; Bonaire or Buen Ayre, Curaçao, and Oruba or Aruba off the South American coast.

*French:* Martinique in the Windward; Deseada, Guadeloupe, Marie Galante, St. Martin (partly Dutch), St. Bartholomew, and Les Saintes, in the Leeward group.

*Venezuelan:* Coche, Cubagna, Margarita, Tortuga, Birds' Islands, &c., off the South American coast.

*Independent:* Hayti.

**WESTLAND**, a provincial district of New Zealand, in South Island, bounded north by Nelson district, south by Otago, west by the ocean, and east by Canterbury, from which it is separated by the chain of the Southern Alps. It is about 200 miles long and about 30 miles in average breadth, its area being about 4642 square miles. It consists principally of hills branching off from the great alpine system, intersected by narrow bush-clad valleys, and merging coastwards into undulating plateaus, river-straths, and shelving coasts. The rivers are numerous but short. Practically the whole of the district is clad with forest. Large tracts can readily be prepared for pastoral purposes, but not much is suitable for agriculture. Gold is found in the valleys of the rivers, especially in those of the Arahura and Waiho, and gold-bearing quartz is also worked in some places. Silver, copper, iron, and tin are among the other metallic treasures of the district, which has also yielded much coal, especially from the valley of the Grey. The climate is equable and temperate. The rainfall is heavy, and snow lies on the high mountains



during much of the year. The capital is Hokitika, the other chief towns being Greymouth, Brunnerton, Kumara, and Ross. Railways connect Greymouth with Hokitika, Jackson, and Reefton (in Nelson district). Westland was formerly part of Canterbury district. Pop. in 1901, 14,466.

**WESTMACOTT**, SIR RICHARD, an eminent sculptor, was born in London in 1775, and was early trained to a knowledge of art by his father, who was a statuary. In 1793 he was sent to Rome to study his profession under Canova, and there made such progress that he gained the annual gold medal for sculpture given by the pope at the academy of St. Luke. He also obtained a first prize for sculpture at Florence, and was elected a member of the Academy there. In 1798 he returned to England, married, and rose rapidly into estimation as an artist. Many of the monuments in St. Paul's are from his chisel, and that cathedral forms, in some respects, a gallery of his works. The figure of a Welsh girl in a monument to the memory of Lord Penrhyn, at Penrhyn, in North Wales, is considered by many as the happiest of his creations. He designed also the Achilles in Hyde Park, the statue of Lord Erskine in Lincoln's Inn Old Hall, that of Nelson in Birmingham, besides figures of Addison, Pitt, and many others. He was elected an associate of the Royal Academy in 1805, a full member in 1811, and in 1827 succeeded Flaxman as lecturer to the Academy on sculpture, an office which he held till his death. In 1837 the dignity of knighthood was conferred on him. He died in London on 1st September, 1856.—His eldest son, RICHARD (1799-1872), was also an eminent sculptor. He succeeded his father as professor of sculpture at the Academy, holding the post till 1867.

**WESTMEATH**, a county in Ireland, in the province of Leinster, bounded on the north by the county of Cavan, on the north-west by Longford, on the west by Roscommon, on the south by King's County, and on the east and north-east by Meath; area, 453,468 acres or 708 square miles. The surface is hilly in the north, but elsewhere undulates gently. The drainage is shared between the Shannon and the Boyne. The former, with its expansion Lough Ree, forms the western boundary of the county, and receives its drainage mostly through the Inny and the Brosna. Lough Sheelin on the northern boundary, and Loughs Derrevaragh, Owel, and Ennel in the interior, should also be mentioned. The climate is mild, equable, and healthy. The soil is light and moorish in the west, and in the east usually consists of a heavy loam. The principal grain-crop is oats, but the greater part of the surface is devoted to grazing, and the cattle reared are considered the best in Ireland. Considerable attention is also paid to dairy-farming. Important means of communication are furnished by the Shannon, the Royal Canal, a branch of the Grand Canal, and the Great Western Railway. Westmeath sends two members to Parliament, being divided into N. and S. Westmeath. The county town is Mullingar, and Athlone is partly in the county. Pop. (1891), 65,028; (1901), 61,629.

**WESTMINSTER**, an ancient city, included within the limits of the administrative county of London, consisting of the ancient civil parishes of St. Margaret and St. John the Evangelist; St. George, Hanover Square; Close of the Collegiate Church of St. Peter, Westminster; St. James, Westminster; St. Martin-in-the-Fields; St. Anne, Soho; St. Paul, Covent Garden; St. Mary-le-Strand; St. Clement Danae, and the Savoy Precinct, of which the first two contain two-thirds of its population. The metropolitan borough of Westminster, still to

be called a city, which was created by the London Government Act of 1899, is practically coterminous with the city as above defined, being bounded on the south and east by the river Thames; east by the City of London, from which it was separated by the former Temple Bar; north by Holborn, Marylebone, and Paddington; and west by Kensington and Chelsea. It is connected with Lambeth by Vauxhall, Lambeth, Westminster, and Waterloo Bridges. The parliamentary borough of Westminster created by the act of 1885 is practically coterminous with the parish of St. Margaret and St. John the Evangelist, the remainder of the city constituting the parliamentary boroughs of St. George, Hanover Square, and the Strand. The city contains some of the finest and most imposing buildings in London, and teems with historical and literary associations. All the metropolitan royal palaces are within its limits, and also Westminster Abbey, the Houses of Parliament, the principal government buildings, the headquarters of the London County Council and the Metropolitan Police Force, the National Gallery and the Tate Gallery, Burlington House, Somerset House, and the principal theatres and opera-houses.

Westminster Abbey, or the Collegiate Church of St. Peter, Westminster, was erected in its earliest form in 616 by an Anglo-Saxon king, Sebert, on the site of a Roman temple to Apollo. This early foundation consisted of a church and a Benedictine convent, the whole being named Westminster (that is, West Monastery) in contradistinction to an Eastminster whose name has not survived. Nothing of Sebert's work remains, and of the later church erected by Edward the Confessor in 1049-55 we have only the Chapel of the Pyx and part of the foundations and cloisters. Henry III. caused most of the edifice to be rebuilt, and subsequent kings continued the work, but the most notable name in connection with the erection of the abbey is that of Henry VII., whose splendid chapel is one of the greatest glories of the building. The only important parts added to the abbey since Henry VII.'s time are the two western towers built by Sir Christopher Wren. The nave is partly Early English and partly Decorated in its architecture. Dr. Livingstone is buried here, and in the north aisle the graves of Purcell and Sterndale Bennett are seen. The nave and its aisles also contain monuments to Sir Isaac Newton, Fox, Pitt, John and Charles Wesley, Isaac Watts, Wordsworth, Keble, Charles Kingsley, and Matthew Arnold. The lofty choir is in Early English style, and contains the supposed tomb of King Sebert and his queen, Ethelgoda, and also the tomb of Anne of Cleves. The south transept is notable as containing at its southern end the famous Poets' Corner, in which are seen the tombs of Chaucer, Spenser, Browning, Tennyson, Drayton, and Ben Jonson, and monuments or memorials to Shakspeare, Samuel Butler, Milton, Addison, Thomson, Goldsmith, Longfellow, Johnson, Sheridan, Burns, Southey, Coleridge, Campbell, Macaulay, Dryden, Thackeray, Dickens, Gay, and others. Henry VII.'s chapel, at the east end of the abbey, is the finest example of Perpendicular work in the country, and consists of a nave and two aisles, with five small chapels round the apse. Henry VII. and his consort rest beneath a splendid black marble tomb in the centre of the chapel, which also contains the tombs of the subsequent sovereigns down to George II., besides those of other illustrious personages. The tomb and monument of Dean Stanley and his wife, and the grave of Addison are likewise in this chapel. The north transept, with a splendid rose-window and a fine



triple entrance known as Solomon's Porch, is the burial-place of Chatham, Fox, Grattan, Castlereagh, Wilberforce, Pitt, Canning, Palmerston, and many others. In front of Henry VII.'s chapel is the Confessor's chapel, containing the tomb and shrine of the first founder of the present abbey, and also the royal tombs. The beautiful chapels diverging from the choir are of great interest in themselves and for their tombs and monuments. Henry III.'s fine octagonal chapter-house, restored in 1865, was the meeting-place of the House of Commons from 1282 to 1547. The other noteworthy parts of the venerable abbey are: the chapel of the Pyx, a former royal treasury; the beautiful cloisters; the deanery, formerly the abbot's house; the college hall, or old refectory, in which the scholars of Westminster School dine; and the Jerusalem Chamber, the death-place of Henry IV. and the meeting-place of Convocation. Westminster School was founded by Henry VIII. out of the spoils obtained by the dissolution of the monasteries, and now occupies the old dormitory of the monastery and Ashburnham House, built by Inigo Jones, and formerly containing the Cottonian Library.

Of the other Anglican churches of Westminster the following are the most important: St. Margaret's, immediately north of the abbey, dating in its present form from Edward I.'s reign, containing the tombs of Caxton and Raleigh, and formerly attended by members of the House of Commons in state; St. John's; St. Anne's, Soho (1686), in which King Theodore of Corsica and William Hazlitt are buried; St. Clement Danes (1682), with the graves of Rymer, Otway, Lee, and Berkeley; St. George's, Hanover Square (1724), noted for its fashionable marriages; St. Martin-in-the-Fields (1726), a fine Greek church containing the graves of Nell Gwynne, Roubiliac, Farquhar, Robert Boyle, and other notable persons; St. Mary-le-Strand (1714); St. Paul's, Covent Garden, built originally by Inigo Jones, in the churchyard of which are buried Samuel Butler, Wycherley, Grinling Gibbons, and other notable men; St. James's, Piccadilly, one of Wren's churches, with a fine interior and some beautiful work by Grinling Gibbons, and containing the tombs of the Vandevelde, Akenside, and Durfey; and the Savoy Chapel (1505), on the site of the former Savoy Palace, notable as the meeting-place of the famous Savoy Conference. The principal Nonconformist churches in the city of Westminster are: Christ Church (Congregational), with a tower and spire erected in memory of President Lincoln; Brunswick Chapel (Methodist); the United Free Methodist Chapel; and King's Weigh House Chapel, Grosvenor Square (Congregational). The leading Roman Catholic churches are the Brompton Oratory, a fine building, associated with John Henry Newman and F. W. Faber, and the splendid new Westminster Cathedral.

The most imposing and important of the public buildings of the borough is the New Palace of Westminster or Houses of Parliament, situated on the bank of the Thames immediately to the east of the Abbey. The present building stands on the site of the royal palace erected by Edward the Confessor in connection with the Abbey, but none of his work or that of his successors remains, except Westminster Hall, which was built in the reign of William II. All the rest of the ancient palace perished in the fire of 1834, after which the present structure was built by Sir Charles Barry with the aid of Pugin at a total cost of about £3,000,000. Westminster Hall, which forms an integral part of the New Palace, is of great interest both architecturally and from its association with many of the greatest

incidents in English history. For further particulars concerning the Houses of Parliament see the article LONDON, where also information is given concerning the royal palaces, the government buildings, the public parks, the squares, the statues and monuments, the bridges, the clubs, the theatres, the art-galleries, hospitals, &c. The new Caxton Hall should also be mentioned.

The history of Westminster goes back to a very early period. It became a city when, in 1540, Henry VIII. made it the see of a bishop, and even though the see was suppressed ten years later it retained the right to the style of city. The only (Anglican) bishop of Westminster was Thomas Thirlby. Since 1831 a branch of the Grosvenor family has borne the title of Marquis, and since 1874 of Duke of Westminster. In 1850 a Roman Catholic archiepiscopal see of Westminster was created by Pope Pius IX., the first occupant being Cardinal Wiseman. Pop. of city and metropolitan borough in 1891, 201,969; in 1901, 182,977; of parl. borough in 1891, 55,774; in 1901, 50,758.

**WESTMINSTER ASSEMBLY OF DIVINES**, a celebrated assembly held in the middle of the seventeenth century for the settlement of a general creed and form of worship throughout Great Britain, at a time when Presbyterianism had gained a strong position in England as well as in Scotland. On the 23rd of November, 1641, the House of Commons (Long Parliament) addressed to the king a remonstrance desiring a synod of the most learned and pious men throughout the island for the settling of the government of the church; but it was not till 1643, after the civil war had begun, that an ordinance was passed (on 12th June) convoking the long-proposed assembly of divines. By this act 121 clergymen, with ten lords and twenty commoners as lay assessors, were nominated as constituents of the assembly. Among the first were—the Bishops of Exeter and Worcester, Drs. George Morley, John Hacket, William Nicholson, Edward Reynolds, and Robert Sanderson, afterwards bishops respectively of Winchester, Lichfield, Gloucester, Norwich, and Lincoln; Dr. James Usher, archbishop of Armagh; Edmund Calamy, John Lightfoot, Cornelius Burges, Thomas Twisse (prolocutor), and numerous other distinguished divines of the Calvinistic or Puritan party. The lay members comprised John Selden, the two Sir Harry Vanes (father and son), Oliver St. John, John Pym, and other noted adherents of the popular cause. The assembly commenced its sittings on 1st July, 1643, in Henry VII.'s chapel, at Westminster Abbey, but in the meantime a proclamation forbidding the assembly to meet had been issued by the king on 2nd June, which had the effect of inducing the greater part of the Episcopal members to absent themselves, and Episcopacy was thus almost entirely unrepresented. The majority of those who remained were Presbyterians, but there was a powerful and energetic minority of Independents. A deputation was now sent along with commissioners from the English Parliament to the General Assembly of the Scottish Church and the Scottish Convention of Estates, soliciting their co-operation in the proceedings of the Westminster Assembly, and accordingly on 16th September four Scottish clergymen, Alexander Henderson, George Gillespie, Samuel Rutherford, and Robert Baillie, with two laymen, Lord Maitland and Sir Archibald Johnston of Warriston, were admitted to seats and votes by an act of the English legislature. The assembly continued to hold its sittings till the 22nd of February, 1649. Among the results of its deliberations were the Directory of Public Worship, which was presented to Parliament on

20th April, and ratified on 2nd October, 1644; the Confession of Faith, presented to Parliament in October and November, 1646, and ratified, with a few verbal alterations, in March, 1648; the Shorter Catechism, presented to the House of Commons on 5th November, 1647, and the Longer Catechism on 15th September, 1648. In the latter period of the sittings of the assembly the growing power of the Independent party in Parliament presented a serious obstacle to the carrying into effect of its recommendations, though in 1648 an order of Parliament was pronounced declaring 'all parishes and places whatsoever', with the exception of chapels for the king and peers, to be under the Presbyterian form of church government. The accession of Cromwell to power destroyed the hopes of the Presbyterians, and on the Restoration the whole proceedings of the Westminster Assembly, with the ratifications of Parliament, were annulled as invalid.

Whilst this celebrated convocation was thus allowed, as regards England, to remain almost inoperative, its deliberations have left on Scotland an impress which will probably never be effaced as long as that country continues a nation. The present standards of the Presbyterian churches in Scotland, both Established and Dissenting, are made up of the various formularies above enumerated. They were ratified by the Scottish General Assembly as follows: The Directory of Public Worship in February, 1645; the Confession of Faith in August, 1647; and the Longer and Shorter Catechism, in July, 1648. See Hetherington's History of the Westminster Assembly (1843; 8th ed., 1891); the Minutes of the Assembly, edited by Mitchell and Struthers (1874); Mitchell's The Westminster Assembly (1883); &c.

**WESTMORLAND**, a county in England, bounded on the north and west by Cumberland, on the south-west by Lancashire and Morecambe Bay, on the south by Lancashire, on the east by Yorkshire, and on the north-east by Durham; area, 500,906 acres, or 783 square miles. The surface, with the exception of a small portion in the south sloping to Morecambe Bay, is very mountainous. The Pennine chain, entering it at Cross Fell on its northern frontier, stretches across it in the north-east, and then curves round, forming the boundary between it and Yorkshire; while the principal chain of the Cumbrian mountains forms its boundary from Helvellyn to Bow Fell, and sends a lofty branch nearly across its centre. Much of the celebrated lake-scenery of England is within the limits or on the borders of this county. Grasmere Lake, Rydal Water, Haweswater, and Brother's Water are wholly within the county, which also includes part of Ullswater and Windermere. The streams, which run generally in narrow romantic dales, are numerous, but comparatively unimportant. The principal are the Eden, Eamont (a boundary stream), Lune, and Kent, the last of which forms the broad estuary which terminates in Morecambe Bay. The strata belong in the west to the lower, and in the centre to the upper Silurian formation; in the east, mountain-limestone is largely developed, and forms some of the loftiest summits; in the north, granite occurs, particularly near Shap, where a low isolated mountain is composed of a small-grained species, containing large brilliant crystals of red felspar; still farther north, in the vale of the Eden, around Appleby, the new red sandstone appears in connection with a small coal-field. The minerals include graphite, for which Borrowdale was long famous; excellent roofing-slate, marble, coal, lead, and copper. The arable land is mostly confined to the valleys, where the soil usually consists of a dry gravelly loam, well adapted for

turnips, large crops of which are produced. The far greater part of the remaining surface is in natural pasture or under wood. The total cultivated area is rather under 250,000 acres, of which fully four-fifths is in permanent pasture. The area under corn crops, almost wholly oats, is only about 16,000 acres, and about half that amount is sown with green crops, principally turnips. The only manufactures of any consequence are the coarse woollens of Kendal. The county is traversed by the London and North-Western and the Midland Railway, and a branch of the North-Eastern. Appleby is the capital, and the other chief towns are Kendal, Ambleside, Kirkby Lonsdale, Bowness, and Windermere. Westmorland sends two members to Parliament, being divided into North and South Westmorland. Pop. (1891), 66,098; (1901), 64,305.

**WESTON-SUPER-MARE**, a seaport town and watering-place in England, in the county of Somerset, situated on the Bristol Channel, at the mouth of the Severn estuary, here about 8 miles wide, and almost right opposite Cardiff, 19 miles south-west of Bristol. It has good shops and hotels, and handsome ranges of houses, a handsome town-hall, several churches and chapels, assembly-rooms, free library, market-house, church institute, a sanatorium, a park and recreation grounds, &c. The schools are numerous and good. It is much recommended as a place of resort both in winter and summer on account of its healthy bracing air and its fine situation. There are many beautiful drives in the neighbourhood. A fine esplanade, pier, pavilion, and swimming-baths have been constructed. In the beginning of last century it was only a small fishing village. Pop. (1891), 15,860; (1901), 19,047.

**WESTPHALIA** (German, *Westfalen*), a name: 1, originally given to a large part of Germany; 2, to a duchy in Germany; 3, to one of the circles of the old German Empire; 4, to a kingdom; 5, to a province of Prussia—of which we shall treat in the above order.

1. The name of *Westphalia* was given from the second half of the eighth century to the western part of the ancient Duchy of Saxony incorporated by Charlemagne in the kingdom of the Franks, that is, to all the country between the Weser and Rhine, while the territory between the Elbe and Weser was called *Eastphalia* (*Ostfalen*). The latter name was lost after the dissolution of the Duchy of Saxony in 1180; the former was retained, and was applied in the first place to a newly-erected duchy.

2. *Duchy of Westphalia*.—This was formed out of the part of the old Duchy of Saxony, then and still called *Süderland* or *Sauerland*, on the Upper Ruhr and Lenne. When Henry the Lion, the last of the old dukes of Saxony, was put under the ban of the empire, this territory was taken possession of by Philip of Heinsberg, archbishop of Cologne, who obtained the title of duke from Frederick Barbarossa. Cologne remained in possession of it until the dissolution of the archbishopric in 1801, upon which it was given, by way of indemnity, to Hesse-Darmstadt. In 1815 it was ceded by this power to Prussia, and was united with the Prussian province of Westphalia.

3. *Circle of Westphalia*, one of the ten circles into which the Empire of Germany was divided by Maximilian I. in 1512. It comprised the region between Lower Saxony, the Netherlands, Thuringia, and Hesse, as well as considerable tracts on the left bank of the Rhine; but the proper Duchy of Westphalia, as an appendage of Cologne, was considered as belonging to the electoral circle of the Rhine. Its total area was 22,175 square miles.

4. *Kingdom of Westphalia*.—The Peace of Tilsit

(July, 1807) had made Napoleon master of all the Prussian territory west of the Elbe, and he also kept possession of the territories of the electors of Hesse and Hanover, and the Duke of Brunswick. Out of the countries just mentioned he created by decree of August 18, 1807, a kingdom of Westphalia, with an area of 14,712 square miles, and a pop. of nearly 2,000,000. Napoleon gave the kingdom to his youngest brother Jerome, and on the 15th of November, 1807, a constitution similar to the French was granted to it. The insurrections that broke out in several parts in 1809 occasioned the adoption of various severe measures, and the introduction of an oppressive system of police. At the same time the king was required to bring his army up to a strength of 80,000 men, which produced great disorder in the finances. In 1810 a part of Hanover was added to the kingdom, the whole area of which was now 17,540 square miles. After the battle of Leipzig (1813) the kingdom was dissolved. On the 26th of October Jerome was obliged to quit his capital (Cassel) and make his escape from the kingdom, whereupon the territories of which it was composed returned to their former possessors.

5. The *Prussian Province of Westphalia* was formed in 1815 out of some of the provinces which Prussia formerly possessed in the circle of Westphalia. It is bounded on the north by the province of Hanover; on the east by Hanover, Schaumburg-Lippe, Lippe-Deimold, Brunswick, Hesse-Nassau, and the principality of Waldeck; south by the province of Hesse-Nassau; and west by the province of the Rhine and the Kingdom of Holland. Its area is 7800 square miles. The surface in the south and north-east is generally mountainous, being traversed by the Westerwald, Rothhaar, Teutoburgerwald, and the Wesergebirge. The north-west spreads out into extensive and often marshy plains, and belongs to the basin of the Ems; the north-east and a small part of the east to the basin of the Weser; the remainder, constituting the far larger portion of the whole, belongs to the basin of the Rhine. The soil is in general far from fertile. Live-stock are numerous, particularly horned cattle, sheep, and swine; the hams made from the latter have long been famous. The staple manufacture is linen, but that of iron is also very extensive. Besides iron and coal in abundance the minerals include copper, lead, zinc, and salt. The province is divided into the three governments of Münster, Minden, and Arnberg. The city of Münster is the capital. Pop. (1895), 2,701,420; (1900), 3,187,777.

**WESTPHALIA, PEACE OF**, the name given to the peace concluded in 1648 at Münster and Osnabrück (both situated in the former circle of Westphalia), by which an end was put to the Thirty Years' war (which see), and a new political system was established in Europe. After preliminaries had been settled at Hamburg towards the end of 1641 the actual negotiations were begun in 1644, at Osnabrück between the empire, Sweden, and the Protestant states, at Münster between the empire, France, and other foreign powers. Among the leading diplomatists engaged were the Count of Trauttmansdorff representing the empire; the Count of Oxenstierna (son of the chancellor) representing Sweden; the Count of Avaux, Abel Servien, and the Duke of Longueville representing France; Lampadius representing Brunswick-Lüneburg; Varnbühler representing Würtemberg; and Wetstein representing Switzerland. Two treaties were drawn up, one at Osnabrück, signed August 6, 1648; and one at Münster, signed October 24, 1648. Peace was restored with the signing of the latter. By this peace the religious and political state of Germany was settled. The sovereignty of the members of the empire was

acknowledged. They received the right of concluding treaties among themselves and with foreign powers, only not against the emperor and empire. Their consent was made necessary to enable the emperor to put any of the members under the ban. The concessions that had been made to the Protestants since the religious peace in 1555 were confirmed. The form of public worship and the right to secularized ecclesiastical benefices were to return to what they were at the beginning of the so-called normal year 1624. The Calvinists (Reformirte) received equal rights with the adherents of the Augsburg Confession or the Lutherans. The elector-palatine had the palatinate of the Rhine and the electorate restored to him; Alsace was ceded to France; Sweden received Western Pomerania, Bremen, Verden, Wismar, and a sum equal to £750,000; Brandenburg, Mecklenburg, Hanover, and Brunswick were compensated by the secularization of numerous ecclesiastical foundations. Germany lost altogether more than 40,000 square miles of territory, and about 4,500,000 of inhabitants. The independence of the United Provinces was recognized by Spain, and that of Switzerland by the empire. The solemn protest of Pope Innocent X. against these terms, particularly in respect of the secularization of bishoprics and abbeys, &c., was not regarded; but the complete execution of the conditions of the treaty was obstructed by many difficulties. See Von Woltmann's *Geschichte des Westfälischen Friedens* (two vols. Leipzig, 1808).

**WEST POINT**, a place in the United States, New York State, pleasantly situated on the right bank of the Hudson, 87 miles south by west of Albany; with the United States military academy established by Congress in 1802. The ruins of Fort Putnam, erected during the revolution, crown a hill 598 feet above the level of the river.

**WESTPORT**, a seaport and market-town in Ireland, in Mayo, at the mouth of a small river in Clew Bay, 10 miles s.s.w. of Castlebar. It has corn-mills, a brewery, and a trade in live stock, grain, butter, &c. There is a steamer service to Liverpool and Glasgow. Pop. (1891), 4070; (1901), 3892.

**WETTER**, a lake in Sweden, about 24 miles south-east of Lake Wener, and extending between the lakes of Mariestad, Örebro, Linköping, and Jönköping; greatest length, 80 miles; medium breadth, about 15 miles; area, 715 square miles. Its height above the level of the Baltic is nearly 300 feet, but its depth is in some parts above 400 feet, or 120 feet below the Baltic level. Its water is very clear. It has periodic rises and falls independent of the wetness or dryness of the season, and is subject, even in the calmest weather, to violent underground swells. When these take place in winter the sounds emitted by the ice in cracking and breaking up are often tremendous. An underground ridge is traceable throughout the whole length of the lake from north to south, and its culminating points form the few islands which appear above its surface. The largest of these is the Visingsö, in the south. The Wetter forms part of a general line of navigation, which extends across the kingdom from east to west, and far into the interior. By the Gotha Canal it communicates with Lake Wener, and by the Motals Canal with the Baltic. The scenery of the lake is in many places magnificent; the chief town on its shores is Jönköping.

**WETZLAR**, a town in Rhenish Prussia, in the government of Coblenz, and 41 miles n.n.w. of the town of Coblenz, in a beautiful valley at the junction of the Lahn and Dill. It has iron-foundries, puddling-furnaces, rolling-mills, soap-works, breweries; manufactures of optical instruments, shoddy, woollen yarn, &c., and a trade in skins and wool. Wetzlar

was anciently a free imperial town, and the seat of the imperial chamber from 1698 to 1806. Pop. (1896), 8350.

**WEXFORD**, a maritime county in Ireland, in the province of Leinster, bounded north by Wicklow, east and south by St. George's Channel, and west by the estuary of the Suir and Barrow, Waterford Harbour, Kilkenny, and Carlow; area, 573,200 acres or 895 square miles. The coasts of Wexford are generally dangerous for shipping, having little good shelter. The chief inlet on the east coast is Wexford Harbour, which, though spacious, is of intricate navigation and obstructed by a bar. Off Carnsore Point, the south-eastern extremity of Ireland, is the Tuskar Rock, on which is a revolving light. A floating light lies a few miles to the south of the Saltees, a group of islands off the south coast. The surface of the interior is hilly, rising into a ridge on the north-west, declining into a level peninsula to the south-east. The strata belong to the clay-slate formation extending along the east portion of Ireland. The chief rivers are the Slaney and Barrow, the latter navigable for large vessels to New Ross, and the former for barges to Enniscorthy. The climate is very temperate. The prevailing soil is light or stiff clay, generally well cultivated, and producing oats, wheat, barley, and potatoes. Fully 300,000 acres are in pasture, nearly 200,000 under tillage, about 10,000 in plantations, and some 57,000 are waste, bog, mountain, &c. Dairies are numerous, and much butter is exported. The fisheries also are important. A small quantity of woollen cloths, checks, and coarse linens are manufactured. Interesting remains of castles and ecclesiastical buildings are scattered throughout the county. Wexford returns two members to Parliament. The county town is Wexford; the next largest towns are New Ross and Enniscorthy. Pop. (1891), 111,536; (1901), 104,104.

**WEXFORD**, a seaport town of Ireland, capital of the county of the same name, at the mouth of the river Slaney. The town is irregularly built, and the streets narrow, but it contains some handsome buildings. It has a county court-house, town-hall, prison, theatre, barracks, &c.; three Roman Catholic churches, besides several Protestant places of worship, nunneries, a Roman Catholic college and various schools. Above the town there is a bridge across the river 1500 feet in length. Wexford was once a place of great strength, and some remains of its ancient thick walls still exist. The harbour is spacious, but has a bar across the mouth. There is a dockyard and patent slip. The herring and salmon fisheries employ many persons; malt, agricultural implements and machinery are manufactured, and distilling and brewing are carried on. The chief trade consists in the exportation of grain, cattle, poultry, butter, &c. In 1885 Wexford ceased to be a parliamentary borough. Pop. (1891), 11,545; (1901), 11,168.

**WEYMOUTH**, a seaport and municipal borough in England, in Dorsetshire, on a beautiful semicircular bay, 7 miles s.s.w. of Dorchester, a terminus on the London and South-Western Railway. A short line also runs to Portland. The borough comprises the adjoining Melcombe-Regis, from which it is separated by the small river Wey. It is well built; has two parish churches, one of them in Melcombe-Regis; several other places of worship, a general and an eye infirmary, town-hall, reading-room, Victoria jubilee hall, libraries, &c. There is a considerable coasting trade, and an active traffic, passenger and other, with the Channel Islands. There are ship-building, sail-making, and rope-making establishments. Portland stone is exported.

Both Weymouth and Melcombe-Regis, particularly the latter, from the beauty of the bay and its smooth, firm sands, attract numerous visitors. There is a fine esplanade, about 1 mile in length, with a slope gradually descending to the sands. Weymouth with Melcombe-Regis, prior to 1885, sent two members to Parliament; it then ceased to be a parliamentary borough; at one time it returned four members. Pop. in 1891, 13,769; in 1901, 19,831.

**WHALE**, the general name given to Mammals of the order Cetacea (which see), though in common language some members of the order, as the narwhal, porpoise, grampus, &c., are seldom called whales. The whales are distinguished by the fish-like form of the body, by the absence of hind-limbs, by the conversion of the fore-limbs into swimming-paddles, and by the possession of a *horizontally-disposed* caudal or tail fin. Several of the Whales are of economic importance, and are keenly pursued for their oil. The oil, except in the case of the sperm-whale, is mostly obtained from the blubber, a thick coating of fat beneath the skin. This substance, besides preserving an equable temperature, helps to reduce the specific gravity of the body, and thus aids the flotation of these immense creatures. The Balænidæ, or 'Whalebone-whales', form the most important group, and are distinguished by the absence of teeth in the adult, although teeth are represented in the fetus. The upper jaw or palate is supplied with plates of *baleen* or whalebone, which simply represent a large development of the epithelial lining of the mouth and gums. These whales are further divided into the two groups of the 'Smooth' and 'Furrowed' species. The Smooth whales have no dorsal fin, and a smooth skin; the Furrowed species having a furrowed skin and a dorsal fin. The Greenland or Right Whale (*Balæna mysticetus*, see Plate at CETACEA, fig. 11) represents the 'Smooth', and the 'Finner' and 'Humpbacked' Whales the 'Furrowed' species. The Greenland Whale is at once the best known and most valuable member of its family. It inhabits the Arctic Seas, and may attain a length of from 30 or 40 to 60 feet. The head is of large size, and the eye is exceedingly small. No hairs are developed on the skin. The animal swims chiefly by the aid of the horizontal or transverse tail-fin, which may measure 20 to 25 feet in breadth. The mouth is very large, and the palate bears two rows of triangularly-shaped plates of whalebone or baleen, which are fringed at their edges, and which measure from 8 to 14 feet in length each, and number from about 200 to 300 on each side of the mouth. They are shown in the plate CETACEA, fig. 12. The function of these plates is that of acting as a sieve or strainer in straining off the water inhaled into the mouth, and of retaining the minute Pteropoda (which see) and other small fry upon which these animals chiefly subsist. These plates of baleen are much sought after in commerce. The average weight of each lamina or plate of baleen is about 7 lbs. Its value varies greatly; recently it was £3000 per ton. About 1½ ton may be obtained from a large-sized whale. Whalebone is prepared for use by being immersed for twelve hours in boiling water, this process rendering it soft and pliable. The nostrils in all Balænidæ are double, and are placed on the top of the head. That whales 'blow' and seem to eject water from these apertures is known to all. The whale rising to the surface often throws up jets of water from the blow-holes, and this water was long alleged to be that taken in by the mouth and strained through the baleen plates. This view is incorrect, as the water taken into the mouth escapes from it sideways, and is not taken into the pharynx at all. The emitted jets consist in reality of

the expired air from the lungs, the hot vapour being condensed by exposure to the colder atmosphere, together with such water as may lie external to and above the nostrils, before the whale begins to blow. The blubber in the Greenland Whale attains a thickness of from 10 to 15 inches, and a large whale will furnish 80 or 40 tons of this substance. These animals appear to produce but a single young one at a birth. They are inoffensive; but when wounded or irritated, especially by the loss of their young, they may turn upon the fishers and effect much destruction. Various other species of the genus *Balæna* are known. The *B. Australis* inhabits the Antarctic regions, and has a smaller proportional head than its Greenland relative. This whale is also known as the Cape Whale, and is found frequently at the Cape of Good Hope. The Furrowed or Humpbacked Whales have short baleen plates and a dorsal fin, and are represented by the *Megaptera longimana* and other species of this genus, in which the swimming-paddles are very long, and extend from one-third to one-fifth the length of the body; by the genus *Balænoptera*, which includes the Piked Whales, with moderately-sized flippers; and by the Rorquals, which form a third group of the Furrowed Whales, and are represented by the *Balænoptera* or *Physalus Boops*, the Rorqual or 'Finner' of the Arctic Ocean, which probably exceeds in size all known animals, and attains a length of more than 100 feet. (See RORQUAL, and the plate CETACEA, fig. 13.) A second important family of the Cetacea is that of the *Phæteridæ* or *Catodontidæ*, represented by the Cachalot or Sperm Whale (*Phæter macrocephalus*). These whales are often known as 'toothed' whales, from the development of teeth in the lower jaw. The upper jaw bears no baleen plates. (See SPERM WHALE.) The *Beluga Catodon* or White Whale belongs to the Dolphin family. It is found in Hudson's Bay and Davis' Straits and is hunted for the sake of the oil and skin. On this species the Greenlanders may be said to depend for sustenance beyond all others. It is a swift animal, and but rarely killed by ordinary whalers. For an account of the whale-fishery see WHALE-FISHERY.

WHALEBONE. See WHALE.

WHALE-FISHERY. The Biscayans were the first people who prosecuted the whale-fishery as a regular commercial pursuit. They carried it on with great vigour in the twelfth, thirteenth, and fourteenth centuries. The whales taken by them were not, however, so large as those taken in the polar seas, and were not very productive of oil; but their flesh was used for food, and the whalebone, which sold at a very high price, was applied to various useful purposes. The failure of whales in the Bay of Biscay put an end to this fishery. The voyages of the English and Dutch to the Northern Ocean, in search of a passage to India, laid open the haunts of the whale; and vessels were fitted out by those nations, the harpooners and part of the crew being Biscayans. The numbers of whales were here so great, and the capture so easy, that many were killed and abandoned merely from the ships being full. It was the practice of these times to boil the blubber on shore in the North, and to fetch home only the oil and whalebone; and the Dutch constructed a considerable village on the northern shore of Spitzbergen which they called *Smeerenberg* (from *smeeren*, to melt, and *berg*), and which, during the busy season, abounded with shops, inns, &c. The Dutch acquired a decided superiority over their competitors in the fishery; and such was the quantity of oil procured that ships were sent out in ballast to assist in bringing home the produce. Whales soon became scarce about Spitzbergen, taking to the deep ocean

and to the Greenland seas; and it became usual to send the blubber direct to Holland. The fishery had at first (1614) been granted to an exclusive company, but was thrown open in 1642: from which time it was carried on to the greatest extent, and to the most advantage. The private ships sent out by the Dutch were fitted out on a principle that secured economy and vigilance on all sides. The hull of the vessel was furnished by an individual who commonly took upon himself the command; a sail-maker supplied the sails, a cooper the casks, &c. The parties engaged as adventurers: each person shared in the produce according to his proportion of the outfit, and the crew was hired on the same principle. The Dutch fishery was most flourishing in 1680, and was then prosecuted by a fleet of 260 ships and 14,000 men. In 1828 Holland sent only one ship to the fishery. France, which in the end of the 18th century had as many as forty vessels engaged in it, has now few or none, and there are not many vessels sent from other European countries. The English whale-fishery was at first aided by bounties from Parliament. In 1732 a bounty of 20s. per ton was given to every whaling ship of more than 200 tons burden. This bounty in 1749 was raised to 40s., but ceased in 1824. In 1815 Britain had 134 ships and 5800 men engaged in the whale-fishery; and in 1821 142 ships, of 44,864 tons, and manned by 6074 seamen, represented the fishing interest. The numbers decreased after this period. In 1829 only eighty-nine vessels, of 28,812 tons, were employed. The British whaling fleet now numbers some half a dozen vessels, of which almost the whole belong to Dundee. Screw-steamers are now employed, and they generally make a sealing voyage in the spring before proceeding to the whale-fishery. The use of steam has greatly facilitated the carrying on of the fishery; but a whaling voyage is always a very doubtful speculation. In 1867, for instance, the British fleet of 11 vessels obtained only a total of 20 tons of oil, whereas in 1873, 10 vessels obtained 1352 tons of oil and 69 of whalebone, and in 1884 again 9 British vessels got only 836 tons of oil and 40 of whalebone.

The whale-fishery has been carried on with as much vigour and success from the United States of America as from any other country. It was begun by the colonists on their own shores at a very early period; but, the whale having abandoned them, the American navigators entered with extraordinary ardour into the fisheries in the Northern and Southern Oceans, from about the middle of the eighteenth century. The American whale-fishery was formerly of much greater extent and importance than at present. In 1852 it employed about 700 ships of the aggregate burden of 193,798 tons, principally belonging to New Bedford, Nantucket, and other ports in Massachusetts, Rhode Island, and Connecticut. The New England whaling interest, however, has greatly declined in recent times, and though that of San Francisco for some time served to counterbalance the loss, the importance of the industry as a whole is now relatively small. In 1894 it employed eighty-five vessels, and during the year over 270,000 lbs. of whalebone were obtained, the total value of the catch being about £250,000.

The locality of the northern fishery has repeatedly changed since the first expeditions. About 1820, the Greenland seas were almost entirely abandoned by the whalers, who resorted to Baffin's Bay and Davis' Straits. The Dutch first begun to frequent Davis' Straits in 1719; after a long interval the British followed their example. Since 1837 the Greenland seas are again the chief resort. The discoveries made in the northern waters by the British exploring voyages have made the fishers acquainted with

several new and advantageous situations for the prosecution of their business. The sea in Davis' Straits is less incommoded with field ice than the Greenland and Spitzbergen seas, but it abounds with icebergs; the fishery in Baffin's Bay and Lancaster Sound is very dangerous.

The instruments of general use in the capture of the whale are the harpoon and lance. The harpoon is an instrument of iron about 3 feet in length, terminating in an arrow-shaped head, the two branches of which have internally a smaller reversed barb, resembling the beard of a fish-hook. When this instrument is forced by a blow into the fat of a whale, and the line is held tight, the principal barbs seize the strong ligamentous fibres of the blubber, and prevent it from being withdrawn. Sometimes the barbs are made so as to lie close to the stem of the harpoon until some force is exerted in dragging the harpoon back, when they at once expand. The object of this arrangement is to enable the harpoon to enter the side of the whale more easily. Whalers at the present day often use a harpoon capable of being discharged from a small swivel cannon placed in the boat. The lance is a spear of iron, 6 feet in length, terminating in a head of steel, made very thin and exceedingly sharp, 7 or 8 inches in length and 2 or 2½ in breadth. These two instruments, together with lines, boats, and oars, form all the necessary apparatus for capturing the whale. Considerable address is requisite to approach sufficiently near to the animal during its short stay at the surface; but when this has been accomplished, the hardy fisher rows directly upon it, and, an instant before the boat touches, buries the harpoon in its back. But if, while the boat is at a little distance, the whale should indicate his intention of diving, the harpoon is thrown from the hand; and when this is done skilfully it is efficient at the distance of 8 or 10 yards. The wounded whale makes a convulsive effort to escape. Then is the moment of danger; and both boat and men are exposed to destruction from the violent blows of its ponderous tail. The animal immediately sinks under water; after this it usually pursues its course directly downwards towards the bottom of the sea. The utmost care and attention are requisite on the part of every person in the boat, while the lines are running out; fatal consequences having been sometimes produced by the most trifling neglect. When the line happens to run foul, and cannot be cleared on the instant, it sometimes draws the boat under water. The average stay under water of a wounded whale, which steadily descends after being struck, is about thirty minutes. The greater the velocity, the more considerable the distance to which it descends, and the longer the time it remains under water, so much greater in proportion is its exhaustion and the facility of accomplishing its capture. As soon as it reappears the assisting boats make for the place with their utmost speed; and as they reach it, each harpooner plunges his harpoon into its back to the number of three, four, or more, according to the size of the whale and the nature of the situation. Most frequently, however, the whale descends for a few minutes after receiving the second harpoon, and obliges the other boats to await its return to the surface before any further attack can be made. It is afterwards actively plied with lances, which are thrust into its body, aimed at the vitals. At length, exhausted by numerous wounds and the loss of blood, the huge animal indicates the approach of death by discharging from the blow-holes a mixture of blood along with the air and mucus which it usually expires, and, finally, jets of blood alone. The sea to a great extent round is dyed with its blood; and the ice, boats, and men are sometimes drenched with it. Its final cap-

ture is sometimes preceded by a convulsive struggle, in which the tail, reared, whirled, and violently jerked in the air, makes a noise that is heard to the distance of several miles. In dying it turns upon its back or its side. To reduce the risks and uncertainties connected with whale-fishing poison has sometimes been tried with the view of killing the animal more speedily. Prussic acid, strychnine, and a mixture of strychnine and woorari poison, have been used for this purpose, sometimes inserted about the barb of the harpoon in such a manner that the receptacle containing the poison is burst when the harpoon receives a backward jerk in the descent of the whale, sometimes lodged in an explosive shell or bullet which is discharged from a rifle, and is exploded in the body of the animal by means of a fuse ignited at the moment of firing. These methods have all been perfectly successful so far as killing the whale is concerned (a whale that has received a sufficient dose of prussic acid into its system lies dead on the surface of the water about five minutes after); but it has been found impossible to get them generally adopted on account of the objection of the sailors to handle animals that have been killed by such powerful poisons. The method of killing the Sperm Whale is much the same as that adopted in killing the common whale, but the behaviour of the animal when attacked is somewhat different. Sperm Whales are gregarious, and when one is struck out of a herd it commonly takes the lead, and is followed by the rest. It seldom descends far under water, but generally swims off with great rapidity, stopping after a short course, so that the boat can be drawn up to it by the line, or be rowed sufficiently near to lance it. In the agonies of death the struggles of the animal are tremendous. The surface of the ocean is lashed into foam by the motions of its tail; and the boats are kept aloft lest they should be dashed to pieces. When a herd is attacked in this way ten or twelve of the number are often killed: those which have been only wounded are rarely captured. When a whale has been captured it is towed by the boats to the ship's side and made fast to the ship's chains. Thereupon the operation of 'flensing,' or depriving the animal of its blubber commences, as well as that of removing the baleen or whalebone. The flensers, shod with spiked boots to prevent them from slipping, descend to the body of the whale, and begin to cut off a long and broad strip of skin, after which they cut out the blubber in this area in large cubical masses, which are hoisted on deck by means of tackle. When this area is cleaned of blubber another blanket of skin is cut off, and the same processes are repeated until all the blubber is removed, which is done in about three or four hours. On deck the blubber is cut into smaller masses, which are boiled in huge pots, and then strained. This operation is called 'making-off' or 'trying out,' and the product of the straining is all that is of commercial value. The fragments of matter retained by the strainer serve as fuel for the pots in which the blubber is boiled. The baleen requires nothing but drying before it is taken home. In the case of the Sperm Whale the flensing is sometimes done differently from the manner used in polar whaling. A strap of blubber is cut in a spiral direction, and being raised by tackles turns the animal round as on an axis until nearly all the blubber is stripped off.

**WHALE-LOUSE** (*Cyamus Ceti*), a genus of small Crustaceans belonging to the order Lamo-dipoda, and so named from the habits of its species in living a parasitic life on whales and other Cetaceans. These Crustaceans have a rudimentary abdomen, and have the limbs of the first joint of the thorax or chest inserted beneath the throat. The



body is flattened and of oval shape, and the legs are all prehensile. They appear to burrow deeply into the skin of their hosts.

WHARTON, PHILIP WHARTON, DUKE OF, was born in December, 1698. He displayed when quite young talents which attracted notice. At the age of sixteen he married clandestinely at the Fleet, to the great disappointment of his father, whose death shortly after left him at liberty to follow his own inclinations. In 1716 he set out on his travels for the purpose of finishing his studies at Geneva. But, disgusted with the sober manners of that place, he left his governor there and went to Lyons, and afterwards to the court of the Pretender at Avignon. That prince, highly gratified by his attentions, gave him the title of Duke of Northumberland. About the end of 1716 he returned to England, and thence proceeding to Ireland, where he possessed a peerage, he was allowed, although not yet nineteen, to take his seat in the Irish House of Peers. He there devoted himself with all his powers of reasoning and eloquence to the established government, in consequence of which he obtained a British dukedom (January 28, 1718). On attaining his majority he made his appearance in the English Parliament, where he pursued a line of political conduct diametrically opposite to that which he had lately exhibited, distinguishing himself as the warm defender of Bishop Atterbury, impeached as an adherent to the House of Stuart. He also published a virulent opposition paper called *The True Briton*. Having impoverished himself by extravagance his estates were by a decree in Chancery vested in the hands of trustees; and he retired to the Continent, and visited Vienna and Madrid. After practising new intrigues, deceiving by the levity of his conduct the Spanish court and the Chevalier de St. George, he rendered himself contemptible alike to all parties. In 1727 he served against the British at the siege of Gibraltar, for which he was in the following year attainted. Overwhelmed with debts he went to Paris, where he lived for some time meanly and disreputably. At length he returned to Spain, and, ruined in health as well as in fortune, he was proceeding towards a mineral spring in Catalonia, when he died at a small village in 1731. His *Life and Writings* appeared in 1732. See J. R. Robinson's *Philip, Duke of Wharton* (1896).

WHATELY, RICHARD, Archbishop of Dublin, was the fourth son of the Rev. Joseph Whately, D.D., of Nonsuch Park, Surrey, prebendary of Bristol. He was born in London, February 1st, 1787. He received his education at a private school at Bristol, and at Oriel College, Oxford. He graduated as B.A. in 1808, and in 1810 won the English essay prize. In 1819 he made his first appearance as an author by publishing his famous *Historic Doubts relative to Napoleon Bonaparte*. This little pamphlet is among the most popular of the author's writings, more than twelve editions of it having been published. The object of it is to show that objections of the same kind as those brought forward by sceptical writers to the truth of the gospel narratives, founded on apparent inconsistencies and absurdities in these narratives, may be brought against any well-known and incontrovertible piece of history, such as that of Napoleon Bonaparte. In 1822 Whately was appointed Bampton lecturer at Oxford, and delivered eight lectures *On the Use and Abuse of Party Feeling in Matters of Religion*. The same year he received the living of Halesworth with Chediston in Suffolk, and though he held it for a short time only, being appointed principal of St. Alban's Hall, Oxford, in 1825, he continued to retain kindly feelings towards his former parishioners, and afterwards dedicated one of his books to them. In 1825 he published

*Essays on Some of the Peculiarities of the Christian Religion* (seventh edition, 1860). A second series of essays *On Some Difficulties in the Writings of St. Paul and in Other Parts of the New Testament*, came out in 1828 (sixth edition, 1849); and a third series, *The Errors of Romanism traced to their Origin in Human Nature*, in 1830 (fifth edition, 1856). In 1827 was published perhaps the most widely known of his works, namely—*The Elements of Logic*, and the scarcely less popular *Elements of Rhetoric*, in 1828. Both of these works were written originally for the *Encyclopædia Metropolitana*, and both have passed through many editions. Like all his writings they are marked by force of style, clearness of arrangement, and homely yet felicitous illustration. The next event of importance in Whately's life was his appointment to the chair of political economy in 1830. He held the professorship for about a year, and the substance of the lectures which he then delivered was afterwards published under the title of *Introductory Lectures on Political Economy*. In Oxford, the last stronghold of antiquated opinion, Whately stood in the front rank of those who held liberal views in ecclesiastical and social matters, and among these his earnest love of truth and honest desire to 'razed out rotten opinion,' his contempt for arguments resting solely on tradition, and the keenness of his logic, gave him great influence. By his theological and other writings, and by the part he had taken in political affairs, especially the support he had given to the Catholic Emancipation measure, his name and abilities had now become well known, yet some surprise and considerable indignation was felt when in 1831 he was appointed by the Whig government of Earl Grey to be Archbishop of Dublin and Bishop of Glendalough. The cause of national education in Ireland he warmly embraced, and for twenty years he was an active and influential member of the board. But in 1853, Dr. Cullen and the Roman Catholic party having objected to a treatise on the *Evidences of Christianity*, composed by Whately, and used in the schools, and having procured its withdrawal, the archbishop resigned his seat at the board. Henceforth he took little part in public life. Among his services to education must be mentioned the foundation and endowment by him of a chair of political economy in Trinity College. He died on the 8th of October, 1863. The bishopric of Kildare had been added to his diocese in 1846. Whately was distinguished by honesty, love of truth, and princely liberality. In manner he was somewhat rough and careless—the reaction, as he said, from the painful sensitiveness with which he had been troubled in his youth. His conversation was rich in joke, and pun, and witty repartee; and he was fond of trapping and puzzling his opponents by logical quibbles, though no man could be sharper in detecting a fallacy in another's reasoning. Besides the works already mentioned, and other original works, Whately published valuable editions of *Bacon's Essays* (1856); *Paley's Evidences*, and *Paley's Moral Philosophy*, &c. See *Life and Correspondence of R. Whately, D.D.*, by his daughter, E. Jane Whately (London, 1866).

WHEAT (*Triticum sativum*). Among the different kinds of grain which form the principal nutriment of the civilized world, and to the culture of which civilization is even attributed by ancient and modern writers, the first rank is universally conceded to wheat. It is now cultivated in almost all temperate climates throughout the greater part of Europe; in all the provinces of China, in Natolia, Syria, Persia, and the other temperate parts of Asia; in the north of Africa and at the Cape of Good Hope; in the United States and even in the extreme southern parts of South America. The plant belongs to the family of



the grasses, like the other cereals. The spikelets of the flowers are sessile, and disposed on two opposite sides of an axis, the whole forming a terminal spike or ear, which in one variety is even branched. The culture of wheat, from time immemorial, and in different soils and climates, has produced numerous varieties, which in some instances have even been mistaken for distinct species. Winter wheat, sown in the spring, will ripen the following summer, though the produce of succeeding generations of spring-sown wheat is found to ripen better. White, red, awned, and beardless wheat change and run into each other in different soils and climates; and even the Egyptian wheat is known to change into the single-spiked common plant. The most permanent varieties are the red and white grained, and the spring wheat, which is generally red. Wheat succeeds best when treated as a biennial, though it does not remain above one year in the ground. Provided the soil be well prepared and dry, and the grain sown in time, the plants do not suffer from the greatest cold, especially if the ground be covered with snow. Animal substances are the best manure for wheat, as containing much gluten—a substance found in a greater proportion in this grain than in any other; and next in importance is lime, as tending to the same effect by chemical combinations. Wheat yields a greater proportion of flour than any other grain, and stands next to oats in point of nutritiveness. Gluten is so essential an ingredient in bread that fermentation cannot go on without it; hence its inferiority in wet seasons, and when the wheat is blighted or ill ripened; and hence the advantage of having a stock of old grain. Wheat starch is made by steeping the wheat, and afterwards beating it in hempen bags. The mucilage being thus mixed with the water produces the acetous fermentation, and the weak acid thus formed renders the mucilage white. After settling the precipitate is repeatedly washed, and then put in square cakes for drying. The straw of wheat from dry, chalky lands is manufactured into hats. Leghorn hats are made from a bearded variety of wheat, not unlike rye, raised on poor, sandy soils on the banks of the Arno, between Leghorn and Florence, expressly for this manufacture. It does not grow above 18 inches in length, is pulled green, and bleached, like flax, on the gravelly bed of the river. The straws are not split, which renders the plait tougher and more durable. (See STRAW, MANUFACTURE OF.) We are ignorant of the country whence this valuable grain was first derived; but it was very early cultivated in Sicily. Spelt (*T. Spelta*) appears to be a distinct species, and more hardy than common wheat. It has a stout straw, almost solid, with strong spikes, and chaff adhering firmly to the grain. The grain is light, yields but little flour, and makes but indifferent bread. It is raised in Switzerland, in elevated situations, where common wheat would not ripen; and also in Bavaria and other parts of Germany.

WHEAT-EAR (*Saxicola oenanthe*), a species of bird of the order Insectores (which see), belonging to the Dentirostral section of the order, and to the family of the Erythracus or Robins. In this genus the bill is flattened at its base, with the nostrils placed in a membranous groove. The wings are long, the third and fourth quills being longest. The tail is even, and the outer toe longer than the inner. The name fallow-chat is also applied to the wheat-ear. This bird occurs in Britain, migrating southwards in winter. Its average length is 6½ inches, and its colour is gray above, the quill feathers of the wings being tipped with black; a black streak incloses the eye and ear-coverts. The breast is brown and the under parts white. The female is coloured dark-brown on the wings, ear-coverts, and tail. The wheat-ear is

much sought after when in good condition as a table bird, its flesh being very delicate. It is usually caught in traps formed of a noose of horse-hair concealed under a turf. By the superstitious the wheat-ear's presence is regarded as a sign of ominous and unfavourable kind; and probably the fact of the nest being often found in collections of old stones in burial-places has tended to increase the superstitious feeling. The nest is buried deeply among stones or in rock-clefts, the eggs being of pale-blue colour, and numbering from four to six.

WHEAT-FLY (*Cecidomyia tritici*), a genus of Diptera or flies, belonging to the family Cecidomyiidae, having a short proboscis terminated by a pair of fleshy lips. The wheat-fly lays its eggs in the flower of wheat, the larvæ eating the pollen of the stamens, and thus preventing the formation of seed. The Hessian-fly or American Wheat-fly (*C. destructor*) attacks the lower part of the wheat stems, the larvæ feeding on the sap. These flies are interesting from the fact that the larvæ of certain species living under the bark of trees are capable of giving origin to other larvæ by a process of internal gemmation or budding.

WHEATSTONE, SIR CHARLES, a distinguished scientific investigator and discoverer, born at Gloucester in 1802; died at Paris October 19, 1875. Before he was of age he commenced business for himself in London as a maker of musical instruments, and in 1823 he attracted the attention of men of science by the publication in Thomson's *Annals of Philosophy* of a paper entitled *New Experiments on Sound*. This was followed by a number of other papers, some of them describing inventions of his own, all of which are remarkable for their ingenuity and delicacy of mechanical construction. In 1834 Wheatstone was appointed professor of experimental philosophy in King's College, London, but he seldom lectured. About this time he began to direct his researches to electricity, and in 1836 he exhibited at King's College experiments showing the velocity of electricity. For this purpose he used a circuit of 4 miles of copper wire. These experiments suggested to him the idea of applying his apparatus to telegraphing. In 1837, in conjunction with W. F. Cooke, afterwards Sir W. F. Cooke, he took out the first patent for the electric telegraph. Another subject that engaged much of the attention of Wheatstone was vision, on which he published various papers, among them a memoir contributed to the *Philosophical Transactions* in 1848, *On some Remarkable and Hitherto Unobserved Phenomena of Binocular Vision*. In 1855 he acted as one of the jurors of the Paris exhibition, and on that occasion he was made a knight of the Legion of Honour; and in 1868 he received the honour of knighthood from the queen. He was a fellow of the Royal Society from the year 1836, and was also a corresponding member of the French Institute and honorary member of the principal academies of science in Europe. He was not successful either as a writer or a lecturer. He wrote no considerable work, but was the author of numerous papers chiefly contributed to the *Philosophical Magazine* and the *Journal of the Royal Institution*. His want of success as a lecturer was solely due to his nervousness; for in familiar conversation he was both fluent and lucid in describing his experiments, and communicating their results.

WHEEL, BREAKING ON THE, a horrible mode of punishment formerly in use on the Continent. The condemned criminal was first fastened to two pieces of wood, in the form of a St. Andrew's cross, with his legs and arms extended, and had the bones of his shins and thighs, and of the fore and upper arms, broken by blows with a bar of iron. After that he

was attached to a small carriage wheel balanced on a stake, and allowed to suffer in this position till he died, sometimes several days after the breaking of his limbs. Later the punishment was so far mitigated that the criminal was put to death by a final blow (a *coup de grâce*) on the breast, spine, or neck, before being exposed on the wheel, and sometimes he was strangled before even the breaking of his limbs took place. This punishment was abolished in France at the revolution, and is now disused everywhere. The French word *roué* (from *roue*, a wheel) properly signifies 'one worthy of being broken on the wheel.'

**WHEEL, PERSIAN.** See PERSIAN WHEEL.

**WHEEL AND AXLE,** one of the mechanical powers, which consists of a wheel round the circumference of which a string may be wound, having a small weight attached to its free end, and an axle whose circumference, being smaller than that of the wheel, will sustain a heavier weight at the end of a string which is wound upon it in the opposite direction to that of the string on the wheel. The wheel and axle is merely a case of the lever; the small weight in ounces or other measure of weight multiplied by the radius of the wheel is equal to the balancing weight on the axle multiplied by the radius of the axle. By reference to Figs. 1 and 2 it will be seen that this power resolves itself into a lever of the

Fig. 1

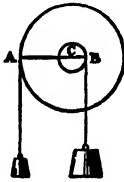
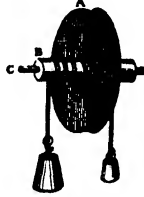


Fig. 2



first order, in which the weight and power are at the ends and the fulcrum between them. C is the centre or fulcrum; A C and C B are the semidiameters of the wheel and the axle; and on the principle of the lever the power is to the weight as A C is to C B. The wheel is grooved, and carries a coil of rope; another rope is secured to the axle; and when the power is in motion every revolution of the wheel raises the weight to a height equal to the circumference of the axle or cylinder. The power is increased by enlarging the wheel or diminishing the diameter of the cylinder; but there is a limit beyond which the increase cannot be obtained with safety. The common winch, the windlass, the capstan, and the tread-mill are so many applications of the wheel and axle; and the same principle may be adapted to a train of wheel-work wherein motion is regulated and power acquired.

**WHEELING,** a city and port of entry of the United States, in West Virginia, capital of Ohio county, finely situated on the east bank of the Ohio River, 92 miles below Pittsburg. It is the most important place on the river between Pittsburg and Cincinnati, and in respect to trade, manufactures, and population the most considerable town of the state. It is the terminus of three railway lines, and the National Road crosses the river opposite the city by a wire suspension-bridge 1010 feet long. The hills in the neighbourhood contain inexhaustible beds of bituminous coal, which afford an abundant supply of cheap fuel. There are several iron-foundries and forges; nail, glass, and paper works; and cotton, silk, and steam-engine manufactories. Woollen goods, white-lead, leather, flour, &c., are also produced here, and there is a brisk river traffic. Pop. (1890), 34,522.

**WHEELS, WATER.** See HYDRAULIC.

**WHEEL-WORK.** When an end to be accomplished in mechanics cannot be attained with convenience by the simple wheel and axle it frequently becomes necessary to transmit the effect of the power to the resistance through a system of wheels and axles acting upon each other. As the wheel and axle is only a modification of the lever, so a system of such machines, acting one upon another, is only another form of the compound lever. In complex wheel-work the power is applied to the circumference of the first wheel, which transmits its effect to the circumference of the second wheel, which again transfers the effect to the circumference of the second axle, which acts upon the circumference of the third wheel, and this, in the same way, transmits the effect to the circumference of the third axle, and thus the transmission of the force is continued until it has arrived at the circumference of the last axle, to which the weight or resistance is applied. There are various ways of transmitting the force of each axle to the circumference of the succeeding wheel. A very common method is by ropes, straps, bands, or belts, round the circumference of the wheel and axle which act upon each other. The action is in this manner transmitted by the tension of the rope or strap, and rendered effective by friction with the circumferences on which it is rolled. Wheels and axles connected in this manner are called *band-wheels*. When the wheel and the axle from which it receives motion are intended to revolve in the same direction the band is simply passed round them in the shortest manner; but when the wheel is to revolve in a direction contrary to the revolution of the axle the strap is crossed between them. This latter method of applying the strap has the advantage of yielding more surface to act upon, and therefore causing more friction. But the most usual way of transmitting the action of the axles to the succeeding wheels is by means of teeth or cogs, raised on their surfaces. When this is the case the cogs on the wheels are generally called *teeth*, and those on the surface of the axle are called *leaves*. The axle itself, in this case, is called a *pinion*. The connection of one toothed wheel with another, in this manner, is called the *gearing*. Wheels are denominated *spur*, *crown*, or *bevelled*, according to the direction or position of the teeth. If the teeth are perpendicular to the axis of the wheel, and in the direction of its radii, it is called a *spur-wheel*. If the teeth are parallel to the axis of the wheel, and therefore perpendicular to its plane, it is called a *crown-wheel*. Two spur-wheels, or a spur-wheel and pinion which work in one another, are always in the same plane, and have their axes parallel; but when a spur and crown wheel are in connection, their planes and axes are at right angles. By this means, therefore, rotatory motion may be transferred from a horizontal to a vertical plane, or *vice versa*. When the teeth are oblique to the plane or axis-wheel, it is called a *bevelled wheel*. In this case the surfaces on which the teeth are raised are parts of the surfaces of two cones. The use of the bevelled wheels is to produce a rotatory motion round one axis, by means of a rotatory motion round another which is oblique to it; and provided that the two axes are in the same plane, this may always be accomplished by two bevelled wheels.

**WHEELK,** a general name applied to various species of Gasteropodous Molluscs belonging to the Branchifera or Gill-breathing section of that class. The Large or Common Wheelk (*Buccinum undatum*) is of common occurrence round our coasts, and belongs to the family Buccinidae, distinguished by the shell having its canal notched, and the mouth or aperture

of large size. The whorls of the shell (see SHELL) are few and rounded. The Whelks are typically carnivorous molluscs, and possess long *odontophores* or tongues provided with siliceous or flinty teeth. These animals are largely used for food and bait, and are caught in 'creels' baited with garbage. The eggs are contained in egg-cases or *nidamental capsules*, bundles of which are common on the sea-coasts. The Red Whelk, or 'Roaring Buckle' of the Scotch, is the *Fusus antiquus* of the zoologist, and belongs to the family Muricidae. In *Fusus* the shell is spindle-shaped; its spire is long and its outer lip thin. The empty shell in the Shetland Islands is used as a lamp by being filled with oil and having a wick drawn through the canal. The Tulip Whelk (*Fusus* or *Fasciolaria Tulipa*) is very richly coloured and inhabits the tropical seas. The Purple Whelk (*Purpura lapillus*) is so named from its affording the dye which made Tyre of old so famous. It belongs to the Buccinidae. Certain species of whelks also belong to the genus *Murex* itself.

WHERRY. See BOAT.

WHEWELL, WILLIAM, master of Trinity College, Cambridge, was born at Lancaster on the 24th of May, 1794. He received his early education at the free grammar school of his native town, afterwards at Heversham Grammar School, whence he went to Trinity College, being enabled to enter that institution by gaining a scholarship. Here he greatly distinguished himself. He gained the chancellor's medal for an English poem in 1814; and when he took his degree of B.A., in 1816, he was second wrangler and second Smith's prizeman. In due course he became fellow and tutor of his college, in which latter capacity he is said to have been very successful. He laboured along with Herschel, Babbage, and Peacock to raise the standard of mathematics in the university, and wrote text-books which were justly celebrated. From 1828 till 1832 he was professor of mineralogy. In 1838 he was elected to the Knightbridge chair of moral philosophy, which he held till 1855, when he became vice-chancellor of the university. In 1841 he was nominated to the mastership of Trinity (worth £3000 a year), and in this position laboured earnestly and successfully to obtain for the natural and moral sciences a better recognized position among the studies of the university. He became fellow of the Royal Society in 1820, and was one of the first members of the British Association, for which he drew up valuable reports on the Tides, and on the Mathematical Theories of Heat, Electricity, and Magnetism. He was president of the association in 1841. He died on the 6th of March, 1866, from the effects of a fall from his horse. Whewell was a strong, healthy, clear-headed man, possessed of a vigorous and capacious intellect, and endowed with extraordinary powers of acquiring and retaining knowledge. The extent and variety of his attainments were something wonderful. Yet there was nothing superficial about his learning, notwithstanding the well-known motto of Sydney Smith, that 'science was his forte and omniscience his foible.' Besides other gifts, he built at his own expense, and presented to his college, a *hœtel*, or collection of chambers for under-graduates. His principal writings, besides mathematical and physical text-books, and multifarious contributions to transactions of learned bodies, scientific journals, and magazines, are:—The *Bridgewater treatise*, *Astronomy and General Physics*, considered with reference to Natural Theology (1833); *History of the Inductive Sciences* (1837); *Philosophy of the Inductive Sciences* (1840); *Novum Organum Renovatum*, *Indications of the Creator*, *History of Scientific Ideas*, *Elements of Morality*, including *Polity*, *Lectures on*

*Systematic Morality*, *Architectural Notes on German Churches*, *On Liberal Education in General*, *Lectures on the History of Moral Philosophy in England*, *Philosophy of Discovery*, *History of Moral Philosophy*, *The Platonic Dialogues for English Readers*, &c. High encomiums have been bestowed on the *History* and the *Philosophy of the Inductive Sciences* by such competent authorities as Professor James D. Forbes, Sir John Herschel, and J. S. Mill. He also translated Auerbach's Professor's Wife, Goethe's Hermann and Dorothea, and Grotius on the Rights of War and Peace, and he was the author of the well-known anonymous essay, *The Plurality of Worlds*.

WHEY. See MILK.

WHIDAH (or WHYDAH) BIRD, the name given to a species of Insectorial birds, included in the order Conirostres, and belonging to the family Fringillidae or Finches. These birds are allied to the Weavers (which see), and belong to the sub-family Ploceinae and to the genus *Vidua*, in which the bill is compressed, and the nostrils hidden by plumes. The wings have their third to fifth quills longest, and the first quill is rudimentary. The tail-coverts and tail-feathers may be elongated; and the tarsi are scaly in front. The Paradise Whydah Bird (*Vidua Paradisea*, Plate II., ORNITHOLOGY, fig. 6) occurs in West Africa, and is of a brownish-black colour, the head, chin, and throat being black, and the neck being encircled by a brown collar. The under parts are pale brown. The tail is long and formed of the two elongated central feathers, which possess broad webs at the base and a slender shaft, whilst the two next feathers are about 11 inches long and are broadly webbed. The other tail feathers are set vertically. This species attains a length of 5 or 6 inches, exclusive of the tail feathers. The nest is said to be ingeniously made of cotton fibres, and to be divided into two compartments, in one of which the female sits on the eggs, the other being occupied by the male bird. The Shaft-tailed Whydah Bird (*V. regia*) inhabits the African coasts, and is coloured of a rusty red on the head and neck, the back of the head and crown being black. The average length is 8 or 9 inches; and the four central feathers are elongated, but consist each of the bare shaft or quill only, a slight web existing at their tips. The name 'Widow Birds' is also given to these birds.

WHIG, in English history, the name which has been for the last two centuries popularly applied to the political party which advocates such changes in the constitution as tend in the direction of democracy. For the principles of the opposite party see TORY. Defoe thus accounts for the origin of the name: 'The use of it began then when the western men (the peasantry of the West Lowlands of Scotland), called Cameronians, took arms frequently for their religion. Whig is a word used in those parts for a liquor (*whig*, Scotch for *whisky*), which the men used to drink . . . and so became common to the people who drank it. It afterwards became a denomination of the poor harassed people of that part of the country, who, being unmercifully persecuted by the government, against all law and justice, thought they had a civil right to their religious liberties, and therefore resisted the power of the prince (Charles II.).' Monmouth was sent to quell the insurrection, and 'at his return he found himself ill-treated for having used the rebels too mercifully; and Lauderdale told Charles, with an oath, that the duke had been so civil to the Whigs because he was a Whig himself in his heart. This made it a court word, and in a little time the friends and followers of the duke began to be called Whigs.' A different origin is, however, assigned to the term.

Sir James Balfour, in writing of an outbreak which occurred in 1648, in his own day, calls the enthusiasts 'whigamores,' and Burnet, who was then five years old, offers the following explanation: 'The south-west counties of Scotland have seldom corn enough to serve them throughout the year, and the northern parts producing more than they need, those in the west come in the summer to buy at Leith the stores that come from the north; and from a word, whiggam, used in driving their horses, all that drove were called the whigamors, and shorter, the whiggs. After the news came of Duke Hamilton's defeat (in 1648), the ministers animated their people to rise and march to Edinburgh; and they came up, marching at the head of their parishes, with an unheeded of fury, preaching and praying as they came. . . . This was called the whiggamors' inroad, and ever after that all that opposed the court came in derision to be called whiggs; and from Scotland the word passed to England.' The Whigs brought about the Revolution of 1688-89, and established the Protestant succession; they were chiefly instrumental in obtaining the abolition of the slave-trade and slavery, the repeal of the Test and Corporation Acts, Catholic emancipation, parliamentary and municipal reform, the repeal of the corn-laws, and similar measures. The term Liberals is now generally applied to the representatives of this party; the extreme section of the party, who agitate for sweeping innovations, usually have a more or less close connection with the Whigs, and have adopted the name of Radicals.

**WHIMBREL** (*Numenius phaeopus*), a species of curlew, having the bill small and not so sharply curved as in the Common Curlew (*N. arquata*). See CURLEW.

**WHIN.** See FURZE.

**WHIN-CHAT** (*Pratincola rubetra*), a species of Dentirostral Insectores (which see), belonging to the family Erythracinae or Robins. This bird is allied to the stonechat (which see), and is so named from its frequenting the neighbourhood of whin and furze bushes. It possesses a long white streak, passing across the sides of the head, which, as well as all the upper parts of the body, is coloured brown. The tail is white at its base and brown at the tip. The chin is white and the throat a fawn colour, whilst the belly is buff. The average length is 4½ inches. The whin-chat, like the wheat-ear (which see), is greatly esteemed for the delicacy of its flesh in the autumn season. It is a migratory bird, arriving in Britain in the middle or end of April, and hatching its young about the end of May. It produces two broods in the year. The nest is constructed on the ground; and the eggs are from four to six in number, and are of a bluish-green hue spotted with brown. Its song is very sweet, and it has been known to imitate the song of other birds.

**WHIPPING**, a punishment inflicted by the law of England chiefly for minor offences. The criminal law consolidation acts (24 and 25 Vict. cap. xvi.-c. 1861) enumerate several offences for which the punishment may be inflicted on males under sixteen. At the time the sentence is passed the number of strokes must be specified as well as the instrument to be used. A subsequent act (25 and 26 Vict. cap. xviii.) enacts that when the offender is below fourteen years of age the number of strokes is not to exceed twelve, and that a birch rod is to be the instrument used. The same act provides that no person is to be whipped more than once for the same offence. Act 26 and 27 Vict. cap. xlii. enacts that, in all cases of robbery or intent to rob, where the attempt is accompanied by personal violence, and in all cases in which an attempt is made to render a person insensible by choking, suffocation, or strangulation, with the view

of committing or assisting others to commit any indictable offence, the court may, in addition to the other punishments provided by the laws, direct that the offender, if a male, be once, twice, or thrice privately whipped. If the offender is under sixteen the instrument used is to be a birch rod, and the number of strokes inflicted not to exceed twenty-five. In other cases the court is to specify the number of strokes at each whipping, and the instrument to be used, and in no case is the number of strokes at one whipping to exceed fifty. The whipping is to take place within six months after the passing of the sentence, and, if the offender is sentenced to penal servitude, before he is removed to a convict prison to undergo that sentence. This law was chiefly aimed at the practice of garrotting (see GARROTE), which was very prevalent at the time of its enactment. It would seem not to apply to Scotland, inasmuch as the second clause of act 25 and 26 Vict. cap. xviii. provides that in Scotland no person above sixteen is to be whipped for theft or crime committed against person or property. By 1 Geo. IV. cap. lvii. it is enacted that no female shall be whipped. By 5 and 6 Vict. cap. li. the offence of striking or firing at the queen was made punishable with whipping. See FLAGELLATION.

**WHIP-POOR-WILL** (*Caprimulgus vociferus*, Wilson), a species of Insectores (which see), belonging to the family Caprimulgidae or Goat-suckers, and to the Fissirostral section of the order. The bill is short and the gape wide. The wings are long, but the tarsi are short. The hinder toe is also very small. This remarkable bird arrives in the Middle States of America about the close of April or the beginning of May, and continues his migrations to the centre of Massachusetts. In the interior it is said to proceed as high as Hudson's Bay. It is a nocturnal bird, and continues the cry from which it derives its name, till midnight, except in moonlight nights. The whip-poor-will, when engaged in its nocturnal rambles, is seen to fly within a few feet of the surface of the earth in quest of moths and other insects. During the day these birds retire into the darkest woods, usually on high grounds, where they pass the time in silence and repose. Their food consists of large moths, beetles, grasshoppers, ants, and such insects as frequent the bark of decaying timber. Sometimes, in the dark, they will skim within a few feet of a person, making a low chatter as they pass. They also, in common with some other birds, flutter occasionally round domestic cattle, to catch the insects which approach or rest on them; and hence the mistaken notion of their sucking goats.

**WHIRLPOOL**, a circular eddy or current in a stream or the sea, produced by the configuration of the channel, by meeting currents, by winds meeting tides, &c. There are some very celebrated whirlpools, such as Charybdis, in the strait between Sicily and Italy; and the Malström, off the coast of Norway. When agitated by tides or winds they sometimes become dangerous to navigators. These are not, however, whirlpools in the strict sense, which are indeed very rare, but merely superficial commotions created by winds meeting tides, and in calm weather are free from all danger.

**WHIRLWINDS** sometimes arise from winds blowing among lofty and precipitous mountains, the form of which influences their direction, and occasions gusts to descend with a spiral or whirling motion. They are frequently, however, caused by two currents of air meeting at an angle, and then turning upon a centre. When two winds thus encounter one another, any cloud which happens to be between them is, of course, condensed, and turned rapidly round; and all substances sufficiently

light are carried up into the air by the whirling motion which ensues. The action of a whirlwind at sea occasions the phenomenon called a *water-spout* (see Plate at CLOUD, fig. 8), the formation of which is thus described:—From a dense cloud a cone descends, in the form of a trumpet, with the small end downwards: at the same time, the surface of the sea under it is agitated and whirled round, the waters are converted into vapour, and ascend, with a spiral motion, till they unite with the cone proceeding from the cloud; frequently, however, they disperse before the junction is effected. Both columns diminish towards their point of contact, where they are not above 3 or 4 feet in diameter. In the middle of the cone forming the water-spout there is a white transparent tube, which becomes less distinct on approaching it; and it is then discovered to be a vacant space, in which none of the small particles of water ascend; and in this, as well as around the outer edges of the water-spout, large drops of rain precipitate themselves. In calm weather, water-spouts generally preserve the perpendicular in their motion; but when acted on by winds, they move on obliquely. Sometimes they disperse suddenly; at others, they pass rapidly along the surface of the sea, and continue a quarter of an hour or more before they disappear. A notion has been entertained that they are very dangerous to shipping, owing to the descent, at the instant of their breaking, of a large body of water, sufficient to sink a ship; but this does not appear to be the case, for the water descends only in the form of heavy rain. It is true that small vessels incur a risk of being overset if they carry much sail; because sudden gusts of wind, from all points of the compass, are very common in the vicinity of water-spouts.

**WHISKY** (a corruption of the Gaelic word *uisge*, water, whisky being called in Gaelic *uisge-beatha*, which signifies *water of life*), the name applied to a well-known liquor distilled from barley, wheat, oats, and other grains; potatoes, beet, and other roots. It is much used in England by rectifiers, who convert it into British gin, and in its simple form is in great repute both in Scotland and Ireland. It may, indeed, be considered the national beverage of both these countries. Whisky from malt alone is made in the Scotch distilleries as follows:—The malt is bruised upon cylinders, and the quantity intended to be mashed is put into the mash pan, water at a temperature of about 170° Fahr. being then added. After two or three hours' agitation the whole is left to repose for an hour and a half, and then the worts are drawn off to about one-third of the water employed. About two-thirds of the first quantity of water of a somewhat higher temperature is put into the pan, and the agitation is renewed for about half an hour. After a second period of repose these second worts are drawn off. Both infusions are now cooled down as quickly as possible to the temperature of 80° or 70° to prevent souring; the wort is cooled down by being exposed in shallow coolers to currents of air, or by being passed through serpentine tubes surrounded with cold water. More water may be let into the pan, and a third wort drawn off, which may be mixed with the other worts, or used instead of water for the first infusion of malt. The quantity of saccharine matter converted into alcohol depends upon the proportion of ferment or yeast introduced into the worts; if too little be used, a portion of the sugar will remain undecomposed; if too much, the spirits will have an unpleasant taste. Generally the worts are let down at the specific gravity of 1·050 or 1·060, and at a temperature of 60° to 50°. For every 100 gallons a gallon of good porter yeast is added and thoroughly incorporated by agitation. An hour

after the addition of the yeast fermentation begins to show itself by a ring of froth round the edges of the vat, and in about five hours frothy bubbles cover its whole surface. Large vats generally afford a better result than small ones, owing to the equality of the fermenting process. It is considered good work when the specific gravity comes down to that of water and superior work when it falls to 0·995. In about forty-eight to sixty hours the wash begins to get clear and comparatively tranquil, and is then ready for distillation. In its simplest form the still consists of a copper boiler into which the wash is poured. This vessel is furnished with a close head terminating in a bent tube which passes in a spiral form through a vessel filled with cold water. (See DISTILLATION.) On the application of heat to the still the spirit begins to rise in vapour at 175°, along with more or less steam. These vapours are condensed in passing through the spiral tube, and trickle in fluid form into a receiver. The product of this first distillation is called low wines. This is again distilled at a lower temperature, which gets rid of part of the water and of the fetid oils that had come over with the alcohol. Great purity and strength can only be obtained by repeated distillation.

**WHIST**, a game at cards, supposed to be of English origin, and a development of a game called *Trump*, popular in the sixteenth century, and played a century later under the name of *Ruffe* or *Whisk*. The latter term seems to have been superseded by the modern name whist about the end of the seventeenth century. Edmond Hoyle, if not the first to raise the game almost to the dignity of a science, is entitled to the credit of having rescued the rules from the uncertainty of oral tradition by giving them a printed existence in his *Short Treatise* published in 1742.—Whist is played with the full pack of fifty-two cards by four persons, two being partners against the other two, the partners sitting opposite each other. The partnership is decided by cutting; those who cut the two lowest cards are partners against those who cut the highest; in cutting the ace is ranked lowest. The player who cuts the lowest card of all takes the deal. Each player may shuffle the cards once, but the dealer claims the last shuffle. The cards are cut by the person on the dealer's right hand, and are distributed one by one to the players in rotation commencing on the left, until the pack is exhausted. The last card, called the trump card, is turned face up by the dealer, and must remain exposed until the first trick is taken. The suit to which this last card belongs is called the trump suit, and takes precedence of all the others. Play is commenced by the person on the left of the dealer laying a card face upwards on the table, to which the others must follow suit; that is, play cards of the same suit if they have any. When all have played, the trick is complete, and is taken by the person who played the highest card. The cards rank as follow:—Ace (highest), king, queen, knave, and the others according to their number of pips. The winner of the trick then *leads*; that is, lays the first card of a new trick, the winner of which becomes in turn the leader, and so on until the thirteen cards held in each hand are played out. When a player cannot follow suit; that is, has no card of the suit led, he may either lay a trump and take the trick, or lay a card of another suit. After the hand is played out the two sides score as follows:—The partners who conjointly gain the majority of tricks in the hand, score one point each for every trick taken above six. The ace, king, queen, and knave of the trump suit are called honours, and score one each for the side who hold them; if one side hold three honours, and the other one, the former score the difference, counting two by honours;

if one side hold all the honours they count four by honours; if the honours are equally divided between the sides they cancel each other, and no one scores by honours. In long whist, an old-fashioned game now seldom played, ten of these points make a game; in short whist, the game now almost universally played, the number has been reduced to five. In short whist, when either party is at four, that party cannot count by honours; and the same holds in long whist when either party is at nine. In short whist it is common to count by tricks alone. A rubber consists of three games, and is won by the party that wins two of them; if one party gains two in succession the third is not played. The theory of the modern scientific game of short whist forbids the player to consider his own hand apart from that of his partner, commanding him to treat both in strict union, and to make every step conducive to the strict interest of the pair. We cannot enter fully into the subject, and must conclude with the following short memoranda, which, according to Cavendish (Henry Jones), a great authority on the game, should be committed to memory:—1. Lead from your most numerous suit, beginning with the lowest unless you have several high cards. 2. Lead your own suit before you return your partner's, unless he leads trumps, which return immediately. 3. In returning your partner's suit, if you have only two, lead the highest; if more, the lowest. 4. But as second or third player, if you hold the best card, play it the second round. 5. Holding five trumps, lead them, or call for them, which is done by throwing away unnecessarily a higher card before a lower. 6. Look out for your partner's call for trumps, especially if weak in them yourself. If he calls, and you hold not more than three trumps, lead the highest; if more, the lowest. 7. Second hand, generally play your lowest. 8. Do not trump a doubtful trick second hand, if you hold more than three trumps; with three or less, trump fearlessly. 9. Do not force your partner if you hold less than four trumps yourself; but force a strong adverse trump hand whenever you can. 10. Discard from your weakest suit. 11. If not leading, always play the lowest of a sequence; for instance, if you hold queen, knave, ten, lay ten. 12. Be very careful in the play of even your lowest cards, every one of which will convey information to your partner. 13. Always play to the score; thus, if you want but one trick to save or win the game, play a winning card at once. Recently a development of whist called *bridge* has become a popular game. See Edmond Hoyle's *Short Treatise on the Game of Whist* (1742); Cavendish's *The Laws and Principles of Whist* (1862; 20th edition, 1892) and *Whist Developments* (1885); Dr. William Pole's *Philosophy of Whist* (1883; 6th edition, 1892) and short treatise in Bohn's *Handbook of Games* (1889); W. P. Courtney's *English Whist* (1894).

WHISTLER, JAMES ABBOTT McNEILL, painter, was born at Lowell, Massachusetts, in 1834. He studied in the West Point Military Academy, and afterwards spent two years in Paris under Gleyre. In 1863 he took up his residence in London, and latterly has resided in Paris. Many of his paintings are peculiar studies in colour which have occasioned much criticism, and in 1877 a severe attack by Ruskin led to a libel action in which the painter got a nominal verdict. His chief pictures are: *The White Girl* (1862); *The Last of Old Westminster* (1863); *At the Piano* (1867); *Portrait of My Mother* (1872), now in the Luxembourg Gallery, Paris; *Portrait of Thomas Carlyle* (1872), purchased by Glasgow Corporation in 1891; *Nocturne in Blue and Green* (1878); *Harmony in Gray and Green*

(1881); *Nocturne in Blue and Silver* (1882); *Entrance to Southampton Water* (1882); *Harmony in Brown and Black* (1884); *Arrangement in Black* (Lady Archibald Campbell—1888); *Arrangement in Gray and Green* (Miss Alexander—1888); and his *Portrait of Sarasate*. He is also a skilled worker in other departments of art, and as an etcher he occupies a very high position. He has published *The Gentle Art of Making Enemies* (1890), in which he deals with Ruskin's attack on his art, and other controversies, a lecture called *Ten O'Clock* being also included in it; and *The Baronet and the Butterfly* (1899). He is an officer of the Legion of Honour, a member of the Société Nationale des Artistes Français, and an honorary member of the Royal Academy of Bavaria.

WHISTON, WILLIAM, mathematician and divine, was born on Dec. 9, 1667, at Norton-juxta-Twycross, Leicestershire, where his father was rector. He was educated at home and at Tamworth school, and entered Clare Hall, Cambridge, in 1686. He graduated B.A. in 1690, was elected a fellow in the following year, and proceeded M.A. in 1693. Ordained deacon in the latter year, he became chaplain to Bishop Moore of Norwich, by whom he was presented in 1698 to the vicarage of Lowestoft-with-Kissingland, in Suffolk. In 1703 he succeeded Sir Isaac Newton in the Lucasian professorship of mathematics at Cambridge after having acted as his assistant for two years. He was an able advocate of the Newtonian natural philosophy, and was associated with his fellow-professor Roger Cotes, another ardent Newtonian, in a series of scientific experiments. He was deposed from his chair and banished from the university in 1710 because he had publicly proclaimed himself an Arian. Proceeding to London, he defended his views in a work entitled *Primitive Christianity Revived* (1711), and in 1714 a court of delegates was appointed by the Lord Chancellor to try him, but the case soon dropped. Whiston was a member of the Society for Promoting Christian Knowledge, which was founded in 1698 by a friend of his; and in 1715 he himself founded a society for the promotion of primitive Christianity. He left the Church of England in 1747 and joined the Baptists. He died on August 22, 1752, at the house of his son-in-law at Lyndon, in the county of Rutland. Whiston was a man of keen intellect and transparent honesty, but he indulged many fanciful and even ridiculous ideas on the fulfilment of prophecy and on other Biblical questions. He believed that the Tartars were the lost ten tribes, and constantly interpreted eclipses, meteors, and similar phenomena as fulfilments of prophecies. His views on clerical monogamy were incorporated by Goldsmith in *The Vicar of Wakefield*. His virulent intolerance was manifested particularly against Athanasius and the creed associated with his name. He was proposed for membership of the Royal Society in 1720, but Newton secured his defeat. His chief works are the following: *A New Theory of the Earth* (1696); *Essay on the Revelation of St. John* (1706); *Prælectiones Astronomicæ* (1707); Boyle lectures on *The Accomplishment of Scripture Prophecies* (1708); *Prælectiones Physio-Mathematicæ* (1710); *Primitive Christianity Revived* (five vols., 1711-12), in which he attaches great importance to the Apostolical Constitutions; *A Course of Mechanical, Optical, Hydrostatical, and Pneumatical Experiments* (1713), in collaboration with F. Hauksbee; *A New Method of Discovering the Longitude* (1714), with Humphrey Ditton; *Commentary on the Three Catholic Epistles of St. John* (1719); *The True Origin of the Sabellian and Athanasian Doctrines of the Trinity* (1720); *An Essay towards Restoring the True Text*



of the Old Testament (1722); *The Calculation of Solar Eclipses without Parallaxes* (1724); *The Literal Accomplishment of Scripture Prophecies* (1724); *Historical Memoirs of Dr. Samuel Clarke* (1780), a valuable work; *The Genuine Works of Flavius Josephus, the Jewish Historian*, in English (1737), which has often been republished; *The Primitive New Testament in English* (1745); and his autobiography (1749; 2nd edition, 1753).

**WHITAKER, JOSEPH**, originator of *Whitaker's Almanack*, was born in London on May 4, 1820. He was apprenticed to a bookseller at an early age, and in 1849 started a church monthly called *The Penny Post*. Soon afterwards he established a theological publishing business of his own in Pall Mall, and in 1856-59 he was editor of *The Gentleman's Magazine*. He made a most successful hit with *The Bookseller*, a periodical founded in 1858 and still in existence; but his name is remembered principally in the title of *Whitaker's Almanack*, which first appeared in 1868. *The Reference Catalogue of Current Literature* was started by him in 1874, and still appears at intervals of four or five years. His death occurred at Enfield on May 15, 1895.

**WHITBREAD, SAMUEL**, Whig politician, was born at Cardington, in Bedfordshire, in 1758, and educated at Eton, Christ Church, Oxford, and St. John's College, Cambridge, graduating B.A. in 1784. After a period spent in European travel and in the work of his father's London brewery, he entered the House of Commons in 1790 as Whig member for Bedford. He at once made his mark in parliament as an able advocate of parliamentary reform, religious and civil liberty, the abolition of slavery, and other similar liberal causes, and as a strong opponent of Pitt's war policy. He took a leading part in the impeachment of Viscount Melville in 1805-1806, and against Lord Chatham for his mismanagement of the Walcheren expedition in 1809. He latterly suffered from mental derangement, and died on July 6, 1815, from a self-inflicted wound in the throat.

**WHITBY**, a seaport and former parl. borough of England, in the North Riding of Yorkshire, 48 miles N.N.E. of York, at the mouth of the Esk, which divides it into two parts, and is spanned by a stone bridge of three arches with a swivel-bridge for admitting vessels into the inner harbour above it. The town consists of brick or stone houses, ranged on bold acclivities, and has an ancient cruciform church (modernized), on the verge of a lofty cliff; several modern churches and Nonconformist chapels; a town-hall, court-house, museum, temperance hall, seamen's hospital, &c. The harbour is spacious and commodious, having 12 to 15 feet water at spring, and 7 to 10 feet at neap tides; wet and dry docks, &c. The manufacture of jet ornaments is carried on, this substance being abundant in the neighbourhood. There are also yards for ship and boat building, and productive sea-fisheries. In 657 Saint Hilda founded her famous priory on the site of Whitby, then called Streoneshalh, and in it was held the important Synod of Whitby in 664, at which the Roman usage as regarded Easter was adopted (see **EASTER**). The poet Cædmon was a resident in this monastery, of which nothing now remains, though the choir, north transept, and part of the nave of an abbey erected on the site in the eleventh century are still standing. These ruins are in Early English style, and extremely beautiful. Whitby ceased to be a parliamentary borough in 1885. The neighbourhood is rich in picturesque scenery and interesting features. Pop. (1891), 13,075; (1901), 11,748.

**WHITE, GILBERT**, a celebrated naturalist, son of a barrister, was born on July 18, 1720, at Selborne, in eastern Hampshire, where his paternal grandfather was vicar. He was the eldest son in a family of eleven, and of his six brothers one (Benjamin) became a publisher in London, and other two (John and Henry) took orders. He was educated at a school at Farnham, in Surrey, and afterwards at the grammar-school at Basingstoke, in Hampshire, kept by Thomas Warton, whose famous sons Joseph and Thomas were among his schoolfellows. He began residence at Oriel College, Oxford, in 1740, and graduated B.A. in 1743, becoming fellow of his college in 1744 and M.A. in 1746. Having taken deacon's orders in 1747, he acted as curate to an uncle at Swarraton, in his native county, and after being ordained priest he was for a short period in 1751 curate to Dr. Bristow, the vicar of Selborne. He was appointed proctor in his university and dean of his college in 1752, and soon after he became curate of Durley, about 6 miles north-east of Southampton. He failed to secure the provostship of Oriel in 1757, but in the same year he obtained the vicarage of Morton Pinkney, in Northamptonshire, which was in the gift of his college. His father died in 1758, and his uncle, the vicar of Swarraton, in 1763, and at the death of the latter he became the owner of his house at Selborne. He never resided on his Northamptonshire living, but throughout his whole life remained closely associated with the Hampshire parish which he has made famous. Soon after his father's death he gave up the Durley curacy for that of Faringdon, near to his home, though for a time he acted as curate of West Deane, Wiltshire. White's great classic, *The Natural History and Antiquities of Selborne*, in the County of Southampton, was published by his brother Benjamin at the end of 1788, with the date 1789 on the title-page. It consists of letters to his two friends Thomas Pennant, author of the British Zoology, and Daines Barrington, who devised the form of *Naturalist's Journal* which White kept from 1767, when he discontinued the *Garden Kalendar* begun in 1751. In the preparation of the part on antiquities, which was compiled only when he had been induced to publish, he was greatly assisted by Richard Chandler, the classical antiquary and traveller. He died at his residence, The Wakes, Selborne, on June 26, 1793, and his body is buried in the chancel of the church there. His *Natural History of Selborne* has won the enthusiastic admiration of men of widely different tastes, and has gone through a very large number of editions. The most important after the first are the following: the so-called Markwick's or Aikin's (1802), including *The Naturalist's Calendar* which Dr. Aikin had compiled from White's papers and published in 1795, but excluding the *Antiquities*; the 1813 octavo, including his poems for the first time; Mitford's (1813, 4to); Rennie's (1833); Bennett's (1837), based upon the preceding; Jardine and Jesse's (1851); Jardine's (1853); Harting's (1875), one of the best, based upon Bennett's; Buckland's (1875), with a chapter on the *Antiquities* by the Earl of Selborne; Prof. T. Bell's (1877), which superseded all previous ones, and may still be regarded as the best (see **BELL, THOMAS**); Grant Allen's (1899), without the *Antiquities*; and Dr. Bowdler Sharpe's (two vols., 1900-1901), including the *Antiquities* and the *Garden Kalendar*. There is a *Bibliography* (1897) by E. A. Martin. See the article in *Dict. of National Biography*.

**WHITE, HENRY KIRKE**, poet, was born at Nottingham, March 21, 1785. He was the son of a butcher, and while a mere boy was employed as a



stocking-weaver. From his infancy he manifested an extraordinary love of learning, and at the age of fourteen produced specimens of poetry worthy of preservation. He was now removed from the stocking-loom to be placed in an attorney's office, and devoted his spare time to the study of Latin and Greek. Increase of knowledge inspired him with the desire to obtain more favourable opportunities for improving his talents; and the advantage of a university education, with the prospect of entering the church, became the great object of his ambition. At length, through the generosity of Mr. Wilberforce and the exertions of the Rev. Charles Simeon, he was admitted a student of St. John's College, Cambridge. There he applied himself to his studies with such unremitting labour, that his health became deranged, and he died October 19, 1806. He published, in 1803, a poem called Clifton Grove; and after his death his Remains, consisting of poems, letters, and fragments, were edited by Robert Southey (two vols. 8vo, London, 1807).

**WHITE-ANTS.** See **NEUROPTERA**.

**WHITEBAIT**, a name given in England to the young fry of the herring and the sprat, especially when caught for the purpose of being used as food. Whitebait, so much celebrated as figuring in the list of dainties of London epicures, has given rise to a great deal of controversy; for while by many it has been regarded as the young of the herring or sprat, or of some other species of *Clupea*, as the Shad (*Clupea alosa*), others have maintained that the white-bait is itself a perfectly distinct species of fish, which ascends fresh-water rivers for the purpose of spawning. As such it has been scientifically designated *Clupea alba*. It was formerly thought to be peculiar to the Thames, but it is known to occur in the Clyde, Forth, and Humber as well, whilst it has been also taken off the Isle of Wight. Its fame was no doubt attained, not so much from the simple quality of its flesh, as from the modes in which it was cooked at Greenwich; and doubtless the fact that it formed a feature in the annual dinner of her majesty's ministers at Greenwich also tended to enhance its reputation. It is a small fish, attaining a length of from 2 to 4 inches. About 5 inches is a maximum length. It is of a pale silvery colour, with a greenish hue on the back. Epicures advise its being cooked as soon as caught. Whitebait are sold in London in June and July.

**WHITE-BEAR.** See **BEAR**.

**WHITEBOYS.** See **IRELAND—History**.

**WHITEFIELD, GEORGE**, founder of the Calvinistic Methodists, was born at Gloucester, where his parents kept the Bell Inn, December 16, 1714. His father dying in his infancy, the care of his education devolved upon his mother. He was sent to a grammar-school at Gloucester, where he distinguished himself by a ready memory and good elocution. Being destined to assist in the business of the inn, he was taken early from school, and for some time officiated as drawer. At the age of eighteen, however, he embraced an offer of being entered as servitor at Pembroke College, Oxford, where he became acquainted with the Wesleys, and joined the small society which procured them the name of Methodists. (See **METHODISTS** and **WESLEY**.) Here, in addition to religious preaching, reading, and visits to jails, and to the poor, he describes himself as lying whole days, and even weeks, on the ground in prayer, choosing the worst sort of food, and dressing in a patched gown and dirty shoes. Hearing of his devotional tendencies, Dr. Benson, bishop of Gloucester, made him an offer of ordination at the early age of twenty-one, which he accepted; and he was ordained a deacon in 1736. Such was his powerful and exciting preaching, that, after his first sermon at Gloucester

a complaint was made to the bishop that he had driven several people mad; on which the prelate observed that he hoped the madness would not be forgotten before the next Sunday. The week following he returned to Oxford, where he graduated as B.A., and soon after was invited to London, to officiate at the chapel of the Tower. He preached also at various other places, and for some time supplied a curacy at Dummer, in Hampshire. The account sent him by the Wesleys of their progress in Georgia at length excited in him a desire to assist in their pious labours; and embarking at the close of 1737, he arrived at Savannah in the following May, where he was received with great cordiality. Observing the deplorable want of education in the colony, he projected an orphan-house, for which he determined to raise contributions in England, where he arrived in the beginning of 1739. Although discountenanced by many of the clergy, Bishop Benson did not scruple to confer on him priest's orders; and on repairing to London the churches in which he preached were incapable of holding the crowds who assembled to hear him. He now adopted the design of preaching in the open air, which he seems first to have practised at Kingswood, near Bristol, among the colliers, on whom his discourses produced a surprising effect, and whose vicious manners and habits he visibly improved. He afterwards preached in the open air in Bristol, and in Moorfields, Kennington, and other places in the neighbourhood of London, to vast assemblages of people. In August, 1739, he again embarked for America, and made a tour through several of the provinces, where he preached to immense audiences, with an effect which is vividly portrayed in the autobiography of Benjamin Franklin. He arrived at Savannah in January, 1740, where he laid the foundation of the orphan-house, and after making another extensive tour, returned to England, where he arrived in the March of the following year. During his absence his cause had been declining at home, and the differences between him and Wesley on the doctrines of election and reprobation deprived him of many followers. His circumstances were also embarrassed by his engagements for the orphan-house; but his zeal and intrepidity gradually overcame all difficulties, and produced the two tabernacles in Moorfields and in Tottenham Court Road. After visiting many parts of England, Scotland, and Wales, where he married in 1741, he again returned to America, and remained there nearly four years, not returning until July, 1748. He was soon after introduced to the Countess of Huntingdon, who made him one of her chaplains. A visit to Ireland and two more voyages to America followed, and for several years his labours were unremitting. At length, on his seventh voyage to America, he was carried off by asthma or angina pectoris at Newburyport, in New England, September 30, 1770. His works were published in 1771 (six vols., 8vo). The principal accounts of his career are Gillies's *Memoirs* (1772), Gledstone's *Life and Travels* (1871), and Tverman's *Life* (2 vols., 1876-77).

**WHITEHALL**, a locality in the west of London, containing several public offices, and named after a palace that once stood here. The building known as the Horse Guards, is so called in consequence of being the station where that part of the troops usually do duty; here is the office of the commander-in-chief of the army. The Treasury, near the Horse Guards, was originally built by Sir John Soane on the site of part of the old palace of Whitehall; the First Lord of the Treasury, however, has his official residence in Downing Street, where also the cabinet meets. The Admiralty Office contains the offices connected with the administration of the naval

affairs of the country. The original Whitehall succeeded a mansion built by Hubert de Burgh before the middle of the thirteenth century. It afterwards came into the possession of the archbishops of York, was inhabited by Wolsey (under the name of York Place), then passed to Henry VIII., and was called Whitehall. Charles I. was executed in front of Whitehall, and he was led to the scaffold out of one of the windows. Oliver Cromwell died in Whitehall. In 1697 the building was destroyed by fire, except the Banqueting Hall, which had been added by James I., according to a design of Inigo Jones, in 1619. This portion still remains, and chiefly consists of one room, of an oblong form and 40 feet high. The ceiling, representing the apotheosis of James I., was painted by Rubens, and was retouched by Cipriani. This building was long a royal chapel, but it now contains the museum of the Royal United Service Institution.

**WHITEHAVEN**, a municipal and parliamentary borough and seaport of England, in Cumberland, situated on a bay of the Irish Sea, 40 miles south-west of Carlisle. It is well built, and, besides various places of worship of no special note, has a town-hall, custom-house, market-house, public library, public baths, with swimming-pond; a theatre, &c. It has a good harbour and a deep-water floating-dock. There is a considerable shipping trade, coals, iron-ore, pig-iron, steel rails, &c., being exported, and American and other produce imported. The manufactures comprise sail-cloth, cordage, anchors, nails, cement, alabaster, earthenware, candles, and soap. Iron ship-building also is carried on, and there are blast-furnaces, iron- and brass-foundries, engineering works, flour- and saw-mills, breweries, a tannery, &c. There are here extensive coal and iron mines, in which a large number of the inhabitants are employed. The coal-mines, which have been worked since the seventeenth century, stretch out some miles under the sea, and coal is wrought beneath the town. Whitehaven returns one member to parliament. Pop. (1891), 19,370; (1901), 19,325.

**WHITE LADY**, a being that, according to a German legend, appears either by night or by day in the castles of several German princes and nobles when any important event, auspicious or otherwise, connected with the family, but especially when the death of any of its members, is imminent. Castles at Neuhaus in Bohemia, at Berlin, Ansbach, Baireuth, Cleve, Darmstadt, and Altenburg are mentioned among others in which this appearance is said to be witnessed. The white lady is regarded as the ancestress of the family, and always appears clad in a snow-white garment, and wearing a bunch of keys at her side. The earliest trace of this legend is found in the sixteenth century, when the white lady of the lords of Neuhaus and Rosenberg in Bohemia became celebrated under the name of Bertha of Rosenberg. The white lady of other princely houses was often believed to be identical with this of Rosenberg, the circumstance of her appearing in the castles of all of them being explained by the affinities between the different families. Popular belief knows also of other white ladies, commonly virgins confined by a spell in castles and mountains until someone comes to deliver them. The leading features of these legends point back to a goddess in the Teutonic mythology, whose influence is felt in birth and death, and who presides over domestic life. The designation of white lady and the name Bertha indicate more particularly the great goddess of nature, who appears under several names, and under the name of Bertha, that is, the 'Bright' or 'Shining', displays her power especially in the period between Christmas and Twelfth Night. Scott, in the *Monastery*,

has introduced, under the name of the White Lady of Avenel, a supernatural being who is represented as attached to the family, the fortunes of which form the subject of the romance, in much the same way as the white lady of German legend is connected with various German houses. The white lady has given its name (*La Dame Blanche*) to an opera, the libretto of which is by Scribe, and the music by Boieldieu, and which has been extremely popular in France since its first production in 1825.

**WHITE-LEAD**, an amorphous basic carbonate of lead used as a pigment. See *CERUSE*.

**WHITE MOUNTAINS**, a part of the Appalachian system of the United States, in the north of New Hampshire, to the east of the Connecticut river, comprising the White Mountains proper and the Franconia Mountains to the south-west. Part of the White Mountains proper is also known as the Presidential Range because its peaks are named from American presidents and statesmen. Its highest summit is Mount Washington (6290 feet), which is the highest peak of the United States east of the Rockies and north of North Carolina. The highest summit of the Franconia Mountains is Mount Lafayette (5270 feet). Several streams, such as the Saco, Androscoggin, &c., traverse this region, which is now a favourite tourist resort owing to the beauty of its scenery. It is well served by railways, and a cog-wheel line ascends Mount Washington from the west.

**WHITE SEA**, a large gulf in Northern Russia, opening into the government of Archangel, between the Kola peninsula on the west and the Kanin peninsula on the east. Near its mouth, and on the eastern side, is a branch of it called the Gulf of Mezen, which receives the waters of the river Mezen, and the inner part of the sea sends off three large arms, namely, the Gulf of Kandalaksha, penetrating north-west into Lapland, the Gulf of Onega, receiving the river Onega, and the Gulf of Archangel, into which flows the Northern Dwina. Of the islands in the sea Solovezk is the largest. The White Sea is mostly comparatively shallow, and it is frozen over from October to May. Archangel, at the mouth of the Northern Dwina, is the leading port of Northern Russia, and other ports on the shores of the sea are Onega and Kem. Canals connect the White Sea basin with the basins of the Caspian, Baltic, and Black Sea.

**WHITE-SWELLING**, the popular name for severe disease of the joints resulting from chronic inflammation in the bones, cartilages, or membranes constituting the joint. The knee, ankle, wrist, and elbow are the joints most subject to this form of disease. It is distinguished from simple inflammation of the synovial membrane (*synovitis*) by the fact that the synovial membrane passes into pulpy degeneration. Amputation is frequently necessary. The disease may be local or constitutional in origin, being in the latter case due to rheumatism, gout, syphilis, pyæmia, &c.

**WHITE-THORN**. See *HAWTHORN*.

**WHITE-THROAT**, the name given to various species of Inessorial birds included in the family Sylviadæ or Warblers (which see), and in the section Dentirotres. These birds belong to the genus *Sylvia*, and have a few bristles at the base of the bill; the nostrils exist in a broad groove, and the wings have the first quill short, and the third and fourth quills longest. The hinder toe has a strong claw. The Common White-throat (*Sylvia undata*, see *ORNITHOLOGY*, Plate II., figure 12), or Nettle-creeper as it is also named, is a very common British bird, and is coloured of a reddish-brown on the upper parts, white on the throat, and brownish-white below. The average

length is  $5\frac{1}{2}$  inches. It is a migratory bird, and arrives in England about the end of April, the males arriving first. The nest is built in open bushes. The song is very powerful and sweet, and the food consists of caterpillars, flies, and other insects. The Garden White-throat or Garden Warbler (*S. hortensis*) is a second species, and the Lesser White-throat (*S. curruca*) a third.

**WHITE VITRIOL**, sulphate of zinc. See **ZINC**.

**WHITING** (*Merlangus vulgaris*), a fish belonging to the Cod family (Gadidae), and very abundant along the northern coasts of Europe. It makes its appearance in vast shoals, keeping at the distance of from half a mile to 3 miles from the shore, and is taken by the line in great numbers. It is considered the most delicate and most wholesome of all the species of cod; but it does not attain a large size, usually not exceeding a foot in length and under 2 lbs. in weight.

**WHITING**, chalk, cleared of its grosser impurities, then ground in a mill, and made up into small masses; extensively employed as a whitewash and for cleaning plate.

**WHITLOW**, in surgery, is an inflammation affecting the skin, tendons, or one or more of the bones of the fingers, and generally terminating in an abscess. In severe cases the disorder extends to many other parts besides the fingers, making its way above the wrist. Whitlows differ very much in their degree of violence and in their depth and extent. Surgical writers usually make four or five varieties. The predisposing cause is a low state of the system. The usual exciting causes of whitlows are various external injuries, as pricks, contusions, &c. The lodgment of a thorn or splinter in the part is another frequent cause.

**WHITMAN, WALT**, an American poet, was born at West Hills, Long Island, state of New York, on 31st May, 1819. He was educated at the public schools of Brooklyn, and while still a youth he learned the printer's trade, teaching also in several country schools in Long Island. For a brief period he edited several newspapers, until in 1847-48 he made an extensive pedestrian tour as a workman through the United States and Canada, subsequently employing himself as a carpenter and builder. His first and chief work, entitled *Leaves of Grass*, was published by himself at New York in 1855. This thin volume of 94 pages was received, for the most part, with abuse, mainly because of its unconventional metrical style, and the freedom with which the poet dealt with moral and social subjects. During the American civil war Whitman's brother was wounded on the battle-field, and the poet, who hastened to his aid, remained afterwards as a volunteer army nurse at Washington and in Virginia for the years 1862-65. After the war he held a government clerkship in Washington, but the fatigue and mental strain of his labours in the hospitals brought about a severe attack of paralysis in 1873. He was in the way of recovering from this illness, when the sudden death of his mother in his presence caused a serious relapse. From this time he resided at Camden, N. J., remaining more or less of an invalid until his death on 26th March, 1892. During all these years Whitman continued to write with the old vigour and freedom of rhythm, but with less of the early crudeness of expression. Besides *Leaves of Grass* already mentioned, he published *Drum-Taps* (1865); *Memoranda during the War* (1867); *Democratic Vistas* (1870); *Passage to India* (1870); *After all, not to Create Only* (1871); *As Strong as a Bird on Pinions Free* (1872); *Two Rivulets* (1873); *Specimen Days and Collect* (1883); *November Boughs* (1885); *Sands at Seventy* (1888); and *Goodbye, my Fancy* (1892).

**WHITSTABLE**, a seaport and watering-place of England, county of Kent, on a bay near the entrance to the East Swale, and opposite to the Isle of Sheppey, 6 miles by rail W.N.W. of Canterbury, with an institute, a new pier, extensive oyster-fisheries, &c. Pop. (1891), 5689; (1901), 7086.

**WHITSUNTIDE**. See **PENTECOST**.

**WHITTLESEY**, a small market-town of England, in the county of Cambridge, 6 miles east by south of Peterborough. Pop. (1901), 3909. About 4 miles south-west of the town was the shallow lake, Whittlesey Mere, 2 miles long by 1 mile broad. It abounded in fish and wild-fowl, but it is now drained, and the land brought under cultivation.

**WHITWORTH, SIR JOSEPH**, English engineer, was born in 1808 and died in 1887. After working as a journeyman engineer he started business in Manchester, and latterly became the head of a great engineering firm. After distinguishing himself as a manufacturer of machine tools, about 1854-55 he began experiments with firearms, and this led him to the invention of the Whitworth type of rifled ordnance, and brought him into competition with Armstrong. He was created a baronet in 1869, and was also F.R.S., LL.D. of Edinburgh and D.C.L. of Oxford. In 1869 he founded the *Whitworth Scholarships*, to encourage the cultivation of combined theoretical and practical skill in the industrial arts of mechanics and engineering. They were placed by the founder under the charge of the educational authorities, £100,000 being invested to form thirty scholarships of £100 each, tenable for three years, the candidates to be selected by open competition, under the conduct of the department of science and art. Ten scholarships were to be competed for each year. Success was to depend on the combined amount of practical and theoretical skill, and the successful applicants were required to pursue their studies under liberal arrangements. In 1873 Sir Joseph Whitworth proposed a modification of the scheme, which was approved of by the council of education, and other modifications have since taken place. There are now four scholarships, to be competed for each year by any young man not twenty-six years complete, who has been engaged in actual handicraft in the workshop of a mechanical engineer for at least three years. The scholarships are of the annual value of £125, and are tenable for three years. There are also exhibitions, tenable for one year, of the value of £50 and £100.

**WHORTLEBERRY** (*Vaccinium*), a genus of shrubby plants, the type of the natural order Vacciniaceae, with alternate membranous leaves, which are permanent or deciduous; the odourless flowers are either solitary or arranged in simple racemes, generally drooping, and tinted with shades of red or pink; calyx 4-5-toothed; corolla urceolate or campanulate, 4-5 cleft, with the limb bent back; stamens 8 or 10, with 2-horned anthers; the fruit, a globose berry, 4-5-celled, many-seeded, of a dark purple, bluish, or red colour. The species are numerous, and are found in most parts of the northern hemisphere. The common Whortleberry, Bilberry, or Blaeberry (*V. myrtillus*) is a hardy plant, grown in forests, heaths, and on elevated mountains. It is found in Britain and in the north and middle countries of the Continent. In some places the berry, which is handsome and has a delicate bloom when in perfection, is found as large as the black currant; they have a pleasant, sweet taste, and are used for making jelly. The berries of the Red Whortleberry (*V. vitis-idaea*) are of a bright red colour, and possess acid and astringent properties. From their great similarity to cranberries they are sold under that name in various parts of Scotland. See **CRANBERRY**.

**WHYDAH BIRD.** See WHIDAH BIRD.

**WHYMPER, EDWARD**, mountaineer and traveler, son of J. W. Whymp, wood-engraver and water-colour painter, was born in London on April 27, 1840. He was educated at Clarendon House school and trained in his father's profession of wood-engraving, but a series of journeys directed his attention and energy to travel, especially in mountainous regions. He ascended Mont Pelvoux in the French Alps in 1861, and three years later he reached the summit of the still higher *Pointe des Écrins* in the same district. He made many other notable ascents in the Alps during 1861–65, especially that of the *Matterhorn* on July 14, 1865. These and subsequent journeys to 'the playground of Europe' provided the materials for his work entitled *Scrambles amongst the Alps* in the years 1860–69 (1871), which secured him a decoration from the King of Italy. In 1867 and again in 1872 he visited northern Greenland, where he found fine specimens of fossil wood and other evidences of a formerly luxuriant vegetation. His most notable mountaineering achievements, however, took place in 1879–80, when he visited Ecuador in South America to explore the equatorial portion of the Andes. He ascended Chimborazo, Cotopaxi, Sincholagua, Antisana, Cayambe, and Cotochachi, all but Cotopaxi for the first time, and made a great many important observations. This expedition produced the three works: *Travels amongst the great Andes of the Equator* (1892); a *Supplementary Appendix* to the preceding; and *How to use the Aneroid Barometer* (1891), and on their publication Mr. Whymp was awarded the Patron's medal of the Royal Geographical Society. His subsequent works are: *Chamonix and Mont Blanc* (1896); and *Zermatt and the Matterhorn* (1897).

**WHYTE-MELVILLE, GEORGE JOHN**, novelist, was born in Fifeshire on June 19, 1821. He was educated at Eton and at the age of eighteen joined the 93rd Highlanders, from which he exchanged in 1846 into the Coldstream Guards. He retired three years later with the rank of Captain, but he volunteered for active service in the Crimean War and was appointed major of Turkish irregular cavalry. The rest of his life was chiefly devoted to fox-hunting and other field sports, and to the writing of novels and other works, most of which treat of fashionable and sporting life. He was killed on Dec. 5, 1878, by the fall of his horse while hunting in the Vale of White Horse, in Berkshire. The following are among his novels: *General Bounce* (1854); *The Interpreter* (1858); *Holmby House* (1860); *Good for Nothing* (1861); *The Queen's Maids* (1862); *The Gladiators* (1863); *The Brookes of Bridlemere* (1864); *Bones and I* (1868); *Contraband* (1870); *Sarchedon* (1871); *Satanella* (1873); *Uncle John* (1874); *Sister Louise* (1875); *Rosine* (1876); *Roy's Wife* (1878); and *Black but Comely* (1879). He also published some volumes of verse.

**WIBORG, or VIBORG**, a town of Russia, in Finland, capital of the government of its own name, on a bay in the Gulf of Finland, 72 miles north-west of St. Petersburg, with which and with Helsingfors it is connected by railway. It presents from the sea a very imposing appearance; is regularly built in spacious streets; and has the ruins of a fine old castle, situated on an isolated rock in an arm of the sea. It carries on some iron-founding and other industries, and has a considerable trade in timber, deals, tar, tallow, and fish. The canal that connects the Gulf of Finland with Lake Saima starts at Wiborg. Pop. (1900), 32,812.

**WICHITA**, a city of the United States, in the state of Kansas, capital of Sedgwick county, on both

sides of the Arkansas river, 161 miles south-west of Topeka. It is situated in a fine agricultural and pastoral district, at the junction of several lines of railway, and has developed rapidly since its foundation in 1870. It is regularly built, and is adequately supplied with water, gas, electric light, and all the needs of a modern city. The principal buildings and institutions are: the United States government building, the county building, the city hall; numerous churches; Garfield University, Wichita University, a commercial college, and other higher educational institutions, besides elementary public schools; hospitals, charitable homes, &c. The industrial establishments include stock-yards, meat-packing houses, factories for agricultural implements and machinery, chemicals, wagons, soap, ice, &c. Pop. in 1880, 4911; in 1890, 23,853; in 1900, 24,671.

**WICK**, a royal, municipal, and parliamentary burgh and seaport of Scotland, capital of the county of Caithness, situated at the head of the Bay of Wick, on the left bank of the river Wick, over which is a handsome bridge connecting it with Pultneytown, incorporated with Wick in 1902. It has well-built substantial stone houses, and contains a number of churches, the handsome town and county buildings, town-hall, temperance hall, and some other schools, free library, &c. The staple employment is the herring-fishing, employing thousands of men, boys, and females. There are some woollen and fishing-net factories, boat-building yards, manure-works, &c., in Pultneytown, and also some boat-building yards in Wick. Along with Cromarty, Dingwall, Dornoch, Kirkwall, and Tain, together constituting the Wick Burghs, it sends a member to Parliament. Pop. of the parl. burgh in 1891, 8463; in 1901, 7882.

**WICKLIFFE** (also **WYCLIFFE**, **WYCLIF**, **WICLIF**, &c.), **JOHN**, a great English reformer, was born at Hipswell, near Richmond, in Yorkshire, probably later than 1324, the date usually given. He studied at Balliol College, Oxford, of which he became master at some date between 1356 and 1361, and he was appointed by his college to the living of Fillingham, in Lincolnshire, in 1361, when he appears to have resigned the mastership. About the same time the pope bestowed upon him a prebend in the collegiate church of Westbury-on-Trym, near Bristol, in which he was apparently confirmed by the king at a later period. In 1368 he gave up Fillingham and accepted the living of Ludgerhall, in Buckinghamshire, and four years later he qualified as doctor of theology. He was presented by the crown in 1374 to the benefice of Lutterworth, in the south of Leicestershire, which he held till his death. It is almost certain that it is an error to identify him with contemporary John Wyclif who are mentioned in connection with Queen's College and Merton College, and even with the namesake who was appointed warden of Canterbury Hall by Archbishop Islip, and removed by his successor. A Latin tract, entitled *Determinatio quedam Magistri Johannis Wycliff de Dominio contra unum Monachum*, has been regarded as belonging to the controversy raised by the refusal of the parliament of 1366 to pay a tribute demanded by the Pope Urban V., in virtue of the homage paid by King John to Innocent III., but some authorities refer it to a date about ten years later, when similar circumstances arose. At the time of writing the tract he was a kind of royal chaplain, for he calls himself *peculiaris regis clericus*, and in 1374 he was named second on a commission which went to Bruges to try to settle disputes concerning ecclesiastical jurisdiction with the representatives of the Pope Gregory XI. He had shortly before been appointed a canon of Lincoln, but he never actually obtained a prebend in that

cathedral. The development of his views on the relation between the ecclesiastical hierarchy and the secular authorities brought him into close association with John of Gaunt, duke of Lancaster, and his party, and in 1377 the anti-Lancastrians sought to strike at their political opponents through Wickliffe. He was summoned in that year before Archbishop Sudbury and his suffragans at St. Paul's, and attended, accompanied by Lancaster, Lord Percy, and other powerful Lancastrians. A violent altercation between the duke and William Courtenay, bishop of London, caused the break-up of the meeting, and the infuriated populace plundered Gaunt's palace and attacked Percy's house. Soon afterwards Pope Gregory sent several bulls to the University of Oxford, the Archbishop of Canterbury, and the Bishop of London, in which he accused Wickliffe of teaching the condemned doctrines of Marsilius of Padua and John of Jandun, and ordered him to be arrested and examined. The parties were reluctant to move in view of Wickliffe's great popularity and influence, and even after the bulls had arrived the heretic was consulted by the government as to whether they might legally prevent money from going abroad to absentee holders of benefices. He eventually appeared before the prelates at Lambeth in 1378, but the king's mother sent a message forbidding them to interfere with him, and a popular demonstration in his favour put an end to the proceedings. In the Gloucester parliament of 1378 he made a defence of John of Gaunt, who had grossly violated the Westminster right of sanctuary.

This year, 1378, the year of the great schism in the papacy, was an important date in Wickliffe's religious development. While continuing to expose the abuses in the Church, he now began to question the whole basis of its sacerdotalism and its authority, and by 1381 he had attained to a substantially Lutheran position in regard to transubstantiation and the mass. About this time also he began to make his great appeal to the common people and to present religion as a vital force rather than a dogmatic system or an organized institution. This appeal assumed two forms, the sending out of his 'poor preachers' and the translation of the Bible from the Vulgate into the English of his day. His itinerant evangelists spread his doctrines throughout the land and soon made the Lollard movement one of great strength and importance. In his translation of the Bible he had the assistance of Nicholas Hereford, an ardent follower, who was responsible for most of the Old Testament, and the whole work was revised by his assistant at Lutterworth, John Purvey, who finished it soon after Wickliffe's death. Wickliffe's heresy on the eucharist was promptly condemned at Oxford and forbidden to be taught there, and in 1382 Courtenay, now Archbishop of Canterbury, summoned a council in the Blackfriars' convent hall, at which Wickliffe's teaching was condemned and some of his followers excommunicated. This council, known as the 'earthquake council' because a violent earthquake occurred during the meeting, ordered the Carmelite Dr. Stokes to publish the condemnation at Oxford. The chancellor of Oxford university at that time, Robert Rygge, was a supporter of Wickliffe and evaded the duty of carrying out the council's mandate until absolutely compelled to do so. Wickliffe himself remained untouched, but he retired to Lutterworth, where he occupied himself in preaching and writing. It is said that Urban VI. summoned him to Rome in 1384, but this is very doubtful. He had a paralytic stroke in 1382 or 1383, and again in 1384, and on Dec. 31 of the latter year he died at Lutterworth. He was buried at Lutterworth, but in 1428, in accordance with a

decree of the council of Constance in 1415, his body was exhumed and burned, and his ashes thrown into the river Swift.

Of the twenty-four Wycliffe propositions condemned by the earthquake council ten were described as heretical and fourteen as erroneous. The most important of the ten were: that transubstantiation is philosophically false, since the substance cannot be changed while the accidents remain; that transubstantiation is not ordained in the Gospels; that confession is not necessary to salvation; that no one after Urban VI. should be recognized as pope; and that it is unscriptural for ecclesiastics to hold temporal possessions. Of the erroneous doctrines, several seriously limited the right of excommunication in a distinctly Protestant sense, one asserted the right of unlicensed preaching, another declared that dominion, whether civil or ecclesiastical, could not belong to one in mortal sin, and another distinctly asserted the authority of the temporal power over the ecclesiastical in temporal affairs. Wickliffe unmistakably made his appeal to Scripture as of higher authority than Church tradition or decrees, and had a strong sense of the personal basis of true religion. He never reached the Lutheran doctrine of justification by faith, but from denunciation of abuses in the Church rapidly advanced to his three main positions: the divine origin of all dominion and its forfeiture by anyone in mortal sin, the unphilosophical and unscriptural character of transubstantiation, and the falsehood of monasticism in every form. At first he attacked only the luxurious and corrupt orders of monks and was on friendly terms with the friars, but from about 1379 the friars were also included in his condemnation. He was one of the last of the realists in philosophy, and he tried to reconcile predestination with the freedom of the human will. Not only was Wickliffe one of the greatest forerunners of the Reformation, but he was also a pioneer in English prose literature. He wrote many learned works in Latin, but the nature of his message and the necessities of his position led him to appeal to the people in works in their own tongue. His chief Latin works are: *De Dominio Divino*, *De Dominio Civili*, *De Officio Pastoralis*, and *Triologus*. All, except the *Triologus* and the *De Officio Pastoralis*, and also volumes of Latin sermons and a volume of Polemical Works, have been edited by English and foreign scholars for the Wyclif Society. The excepted works were edited by Lechler (1869 and 1863 respectively). His translation of the Bible was edited by Forshall and Madden (four vols., 1850); and his English Works are to be found in the three collections: *Three Treatises of John Wycliffe* (1851), by Todd; *Select English Works of Wyclif* (1869-71), by T. Arnold; and *The English Works of Wyclif hitherto unprinted* (1880, Early English Text Society), by F. D. Matthew.

The principal works on Wickliffe's life and work are the following: the article by Rev. Hastings Rashdall in the *Dict. Nat. Biog.*, where the original authorities are given; Lechler's *Johann von Wiclif und die Vorgeschichte der Reformation* (1873), translated as *John Wiclif and his English Precursors* (1878); Poole's *Wycliffe and Movements for Reform* (1889) and *History of Mediæval Thought* (1884); Burrows's *Wiclif's Place in History* (1881); Buddensieg's *Johann Wiclif und seine Zeit* (1885); Sargeant's *John Wyclif* (1893), in *Heroes of the Nations*; Loserth's *Hus und Wiclif* (1884; Eng. trans. 1884); and Trevelyan's *Age of Wycliffe* (1898).

WICKLOW, a maritime county of Ireland, in the province of Leinster, bounded on the north by the county of Dublin, on the east by St. George's Channel,

on the south by the county of Wexford, on the west by Carlow and Kildare; greatest length, 40 miles; breadth, 33 miles; area, 500,178 acres, of which nearly a fifth is under crops of all kinds, the principal being oats and potatoes. The coast is mostly precipitous, and dangerous from sand-banks. The surface is diversified and picturesque, rising into mountain-groups, the loftiest of which is Lugnaquilla, 3039 feet high, and intersected by deep and romantic valleys. The sea-cliffs and most of the interior of the county consist of clay-slate; the central mountains have a nucleus of granite protruding through the slate. Its minerals include a little gold in the streams, lead and copper ores, and pyrites in considerable quantities. The principal rivers are the Slaney and Liffey, which rise in the county, and the Vartry and Avoca. The climate is exceedingly mild and agreeable. The pastures are extensive, but the fisheries are neglected. Wicklow returns two members to Parliament, the divisions being East and West. Its chief towns are Bray, Arklow, Wicklow, the capital, and Balinglass. Pop. (1891), 61,934; (1901), 60,824.

WICKLOW, a town of Ireland, capital of the county of Wicklow, on the estuary of the river Vartry, with a harbour of comparatively recent construction, about 30 miles south by east of Dublin. There are churches for Roman Catholics, Protestant Episcopalians, Presbyterians, Methodists, and others, and also a county court-house, coast-guard establishment, jail, infirmary, fever hospital, &c. It has cattle and horse fairs, a weekly market for general produce, and some import and export trade. Pop. in 1891, 4125; in 1901, 3288.

WIDDIN, or VIDIN, a town of Bulgaria, on the right bank of the Danube, near the Servian frontier, consisting of three parts, the town on the Danube, the walled city, and the citadel. The principal buildings are the palace, several mosques with tall minarets, and a range of bazaars lining the main street. Ships can reach the town at high-water. There is a considerable trade, chiefly in corn, wine, and salt, and the chief manufactures are gold and silver filigree work and jewellery. Widdin was formerly strongly fortified, but the treaty of Berlin (1878), which erected Bulgaria into a hereditary principality tributary to the Porte, decreed that its fortifications should be dismantled. Pop. in 1893, 14,551.

WIDGEON, or WIGEON (*Marca*), a genus of Anatidæ or Ducks, belonging to the Anatinae or sub-family of the true Ducks, and distinguished by the bill being uniformly broad throughout, and the *lamina* or fringes very prominent. The wings have their first and second quills longest. The species *M. Penelope* is common in Britain. The head and neck are, in the males, of a rich chestnut colour, with the exception of a yellowish cream-colour band passing from the forehead over the crown; the breast is pale-red, and the under parts white; the back is grayish-white, with irregular black lines; primaries dusky brown, speculum glossy green; and the tail nearly black. The average length is about 20 inches. The female is less brightly coloured than the male, and exhibits a ruddy brown on the head and neck, with darker markings; the back being brown, and the abdomen white. The male loses his brilliant colours after the breeding season. They arrive in this country from the north (where they breed) in September or October, and they migrate northwards in March and April. The American Widgeon (*M. americana*) is rather larger than the preceding species.

WIDNES, a municipal borough of England, in Lancashire, on the Mersey (here crossed by a mag-

nificent iron-girder bridge), opposite Runcorn, 13 miles S.E. of Liverpool by rail. There are extensive chemical, alkali, and soda works; soap, candle, grease, and manure works; copper-smelting works and rolling-mills, and iron-foundries. The town has a considerable carrying trade, which has been further developed by the construction of large docks in 1864, extended in 1884. It gives name to a parl. div. of the county. Pop. (1891), 30,011; (1901), 28,580.

WIDOW. See DOWER and JOINTURE.

WIELAND, CHRISTOPH MARTIN, was born 5th September, 1733, near Biberach, in Suabia, and received from his father, a Pietist clergyman, an excellent education. In his twelfth year he composed Latin and German verses. From his fourteenth to his sixteenth year he was sent to school at Klosterberge, near Magdeburg, and he afterwards lived with a relation in Erfurt, who prepared him for the university. In the autumn of 1750 he went to the University of Tübingen to study law, but most of his time was devoted to belles-lettres. In 1751 appeared his *Zwölf Moralische Briefe*, which met with a very favourable reception. He also wrote at this time a didactic poem called *Anti-Ovid*. In 1752 he went to Zürich as a literary companion to Bodmer. He was inspired by the deeds of Frederick the Great to write a poem exhibiting the ideal of a hero, for which purpose he chose the story of Cyrus. The first five cantos appeared in 1759, but the poem remained unfinished. About this time he published *Araspes and Panthea*, an episode from the *Cyropædia* of Xenophon. In 1754 he left Bodmer's house, became a tutor, and in 1760 returned to Biberach, where he translated twenty-eight of Shakespeare's plays (1762-63, eight vols.). In 1762 he went to live with Count Stadion, an accomplished scholar, but a thorough man of the world, averse to all religious enthusiasm. Wieland had been formerly prone to religious mysticism, but the gay pleasure-seeking life of the society with which he now came in contact, and the sceptical and cynical kind of literature now most at his command, produced an entire change of sentiment. The first production of his bearing the stamp of his new philosophy of life was the tale of *Nadine*, which he himself calls a composition in Prior's manner. This was followed in 1764 by *Die Abenteuer des Don Sylvio de Rosalba* (the *Adventures of Don Sylvio de Rosalba*), a work in which he took Don Quixote as a model. In 1766 and 1767 appeared his *Agathon*, which established his reputation. His chief work devoted to the subject of love, which at this time occupied much of his attention, is *Musarion* (1768), a production distinguished for grace, ease, and harmony. In 1770 he wrote *Die Grazien* (The Graces); and the *New Amadis* in 1771, a poem which celebrates the triumph of intellectual over mere physical beauty. In 1765 Wieland married, and in 1769 was appointed *professor primarius* of philosophy at the University of Erfurt. From this time he no longer occupied himself exclusively with amatory poetry. In his *Verklagter Amor* (Cupid Accused) he defended this kind of poetry; and in the *Dialogen des Diogenes von Sinope* (1770) he gave a general vindication of his philosophical views. In 1772 he was invited to Weimar by the Duchess Anna Amalia as tutor to her two sons, with the status of Hofrath and a salary of 1000 thalers, which was continued when he ceased to act as tutor. He now turned his attention to dramatic poetry, and wrote his *Wahl des Hercules* (Choice of Hercules), and his *Alceste*. He also edited the *Deutscher Mercur*, a monthly journal, which he conducted till nearly the close of his life. His views, as exhibited in this journal, showed too much of the narrow



conventional spirit of French criticism, and he was therefore attacked by Goethe, who wrote a satire against him under the title of *Götter, Helden, und Wieland* (Gods, Heroes, and Wieland), which Wieland answered with great good-nature, recommending it to all who were fond of wit and sarcasm. Goethe and Herder were soon drawn to Weimar, where the Duchess Anna Amalia formed a galaxy of talent and genius. Schiller afterwards joined the circle. In 1778 appeared his *Geschichte der Abderiten*. Oberon (1780), a romantic epic, is the most successful of his larger works. Wieland also prepared translations of Horace, Lucian, and the Letters of Cicero. He died January 20, 1813. See Gruber's *Biographie Wielands*, and Wieland's *Ausgewählte Briefe*.

**WIELICZKA**, a town in Austrian Galicia, pleasantly situated 8 miles south-east of Cracow, noted for its extensive mine of rock-salt, regarded as among the richest in the world. Salt has been mined here for many centuries, and the workings underground now occupy an area about as large as that of the town above them. They form a perfect labyrinth, and are considered a very interesting sight by visitors. There is to be seen, among other things, a chapel adorned with statues and images of salt, a salt lake, &c. Pop. (1890), 6037; (1900), 6012.

**WIERTZ**, ANTON JOSEPH, Belgian painter, was born at Dinant on Feb. 22, 1806, and studied art in the Antwerp Academy, where he gained, in 1832, a prize which enabled him to continue his studies in Rome. On his return to his native country he lived at Liège for a time, and from 1848 at Brussels, where the Belgian government erected a large studio for him in 1850. He died at Brussels on June 18, 1865. Wiertz was a painter of great, though eccentric genius. He had a strange predilection for horrible and fantastic subjects, and invented a method of painting, called by himself *peinture mate* (dull painting), agreeable to his wayward genius. His principal pictures are the following: Greeks and Trojans contending for the Body of Patroclus; The Flight into Egypt; Death of Dionysius; The Triumph of Christ (1848), his masterpiece; The Things of To-day in the Eyes of the Men of the Future; The Beacon of Golgotha; The Last Cannon; Napoleon in Hell; A Second after Death; Buried Alive; Satan; Suicide; and Hunger, Folly, and Crime. He did not sell any of his chief paintings, but supported himself by painting portraits. His Brussels studio was fitted up after his death as the Musée Wiertz, and contains his large pictures. His principal writings are a Eulogy of Rubens (1840) and *Caractères Constitutifs de la Peinture Flamande* (1863).

**WIESBADEN**, a town in Prussia, in the province of Hesse-Nassau, capital of the government of Wiesbaden, and formerly capital of the Duchy of Nassau, beautifully situated among vineyards and orchards on the southern slopes of the Taunus range, about 8 miles north of the Rhine and 20 miles west of Frankfurt. It annually attracts about 80,000 visitors from all parts of Europe by its baths. It is in general regularly built, and has many fine public and private buildings. The churches include one for English visitors. Among other edifices may be noted the royal palace, the ducal palace, the town-house, the government buildings, the court-house, the museum and picture-gallery, the library (100,000 vols.), the royal court theatre, the Trinkhalle, and the Kurhaus, consisting chiefly of a large and splendid saloon, forming the east side of a square, while the north and south sides are lined by colonnades, filled with gay shops, and uniting a promenade and a bazaar. The springs, all of which except one are alkaline and

among the most powerful of their class, are very numerous, and have temperatures varying from 100° to 153° Fahr. The last is the temperature of the Kochbrunnen, the principal spring, which seems in violent ebullition, from the vast quantity of carbonic acid gas which is continually rising and escaping in bubbles. Pop. (1890), 64,698; (1900), 86,111.—The government of Wiesbaden comprises almost the whole of the former Duchy of Nassau, most of the territory which belonged to the city of Frankfurt, &c. Area, 2108 square miles; pop. (1900), 1,007,839.

**WIFE**. See **HUSBAND AND WIFE**.

**WIG**. The use of wigs is traced back to the ancients. They were used especially by the women. The fashion is said to have been copied by the Greek ladies from those of Egypt. Under the Roman emperors it became common even for men to wear wigs, and several of the emperors themselves used this ornament. In the latter half of the sixteenth century the fashion became much in vogue in France, Italy, and England. In 1560 no lady appeared at the French court without a blonde wig. Under Louis XIII. (1610-43) wigs became still more common, being now used as an ornament by men as freely as by women not only in France, but over all Europe. Louis XIV. was at first averse to wigs; but in the latter part of his reign, when he began to lose his own hair, he reintroduced the fashion, which went to a greater extreme than ever. It was now that the many-tiered wigs, reaching halfway down the back, were first used. About 1660 they began to be worn by the clergy, who had at first shown themselves hostile to the practice. The practice of powdering these wigs was adopted about the year 1700. About 1720 the great wig began to give place to the queue, which remained the fashion till early in the nineteenth century. Modern refinement has abolished the wig as an ornament except (in this country) for the lord-chancellor, judges, and barristers; and where wigs are needed, care is taken to make them as far as possible resemble nature.

**WIGAN**, a county, municipal, and parliamentary borough of England, in Lancashire, on the river Douglas and the Leeds and Liverpool Canal, 18 miles west by north of Manchester and 19 miles north-east of Liverpool. It is well-built in its newer parts. The most noteworthy buildings and institutions are: the original parish church, in late Perpendicular style, restored in 1856; some fine modern Anglican churches; places of worship for Roman Catholics, Congregationalists, Baptists, Methodists, Unitarians, and others; an endowed grammar-school and other educational institutions; the town-hall and the public offices; the court-house; a public hall, a market-hall, and the volunteer drill-hall; a mechanics' institution and a free public library; a corn exchange; public baths; an arcade; an infirmary; a workhouse; &c. It stands in the centre of a rich and extensive coal-field, and has cotton-spinning factories, manufactures of gingham, calicoes, checks, and other cotton goods, linen works, iron and brass foundries, iron-forges, railway-wagon works, oil and grease works, and bolt, screw, and nail works. Wigan is an ancient town, and sent two members to Parliament from the sixteenth century till 1886, but it is now represented by one. Pop. in 1891, 56,013; in 1901, 60,770.

**WIGHT**, ISLE OF, an island off the south coast of England, in the county and opposite to the mainland portion of Hants. It is separated from the mainland by the roadstead or channel of Spithead on the east, and by the Solent or continuation of this on the west. It is in shape something like a lozenge, about 23 miles in length from east to west, by 15 miles broad; circuit about 70 miles; area, 93,841



acres, or 146 square miles. Part of the coast, particularly the south and south-west, is high, and terminates in steep cliffs. The island slopes downwards to the north, as is shown by the course of its chief streams, the Medina, Yar, and Eastern Yar. The general appearance of the country is exceedingly diversified, presenting a constant succession of hill and dale, intermingled with woody tracts and well-cultivated lands. The air is remarkably healthy, and its mildness is evinced by the luxuriant growth of myrtles and other delicate plants in the open air. The district known as the Undercliff, lying along the south-east coast, and completely sheltered from north, north-west, and west winds, has long been much resorted to by invalids. Only a small portion of the surface is waste. The downs, which cross the island from east to west and form excellent sheep-walks, separate it into two districts, which in their general character contrast with each other, the soil on the north side being generally a stiff, cold clay, and on the south side a fertile sandy loam. Excellent cement is manufactured at the works on the west side of the Medina, and largely exported. The chief imports are cattle, coal, timber, and building material. The island is well defended, being protected on the east side by Sandown Fort, Bembridge Fort and Battery, and by other forts which lie between the island and the mainland. The western approach is guarded by Hurst Castle and other forts.

The Isle of Wight is represented in Parliament by one member. The chief towns are Newport (the capital), Ryde, Cowes, Ventnor, Brading, Yarmouth, and the fashionable health-resorts of Sandown and Shanklin on the south-east coast. Osborne, situated on the isle, was a residence of Queen Victoria.

Among the antiquities of the Isle of Wight the most interesting is Carisbrooke Castle, which stands a little south-west of Newport, and consists of extensive and well-preserved picturesque ruins. It has many historical associations: it is supposed to have originally been a fortress of the Britons, was afterwards repaired and enlarged by the Romans, was considerably strengthened under Cerdic, who founded the Kingdom of Wessex, and rebuilt in the reign of Henry I. During the parliamentary war it became the asylum of King Charles I. on his escape from Hampton Court, and afterwards his prison. Another interesting remain is Quarr Abbey, about 2½ miles from Ryde, which was built in 1132, and is now a farmhouse. Pop. in 1891, 78,672; in 1901, 82,387.

WIGTON, a market-town (and parish) in England, in the county of Cumberland, on a gentle acclivity, 11½ miles south-west of Carlisle, with which it is connected by railway. There are a parish church and several other places of worship, including a Roman Catholic church with a convent and orphanage, county court, mechanics' institute, and a very fine memorial fountain in the market-place. There are tanneries, preserve-works, and a clothing-factory. Pop. (1901), 3691.

WIGTOWN, an ancient royal burgh of Scotland, in Wigtownshire, pleasantly situated near the north side of the Bladenoch river, where it falls into the Bay of Wigtown, at the distance of 94 miles from Edinburgh. It is a neat, well-kept place, with a handsome parish church and a fine town-hall and court-house. Prior to 1885 it united with Whithorn, Stranraer, and New Galloway in sending a member to the House of Commons. Pop. (1891), 1509; (1901), 1386.

WIGTOWNSHIRE, a county occupying the south-western extremity of Scotland, forming the western part of the ancient district of Galloway. It is bounded on the east by Kirkcudbright or Eastern Galloway, also by Wigtown Bay; south and west by the Irish Sea; and north by Ayrshire. Area,

314,405 acres, of which fully a third is mountain and heath land, used for grazing; about a ninth is under corn crops, almost wholly oats; about one-eighteenth is under green crops, mostly turnips; and one-ninth is in permanent pasture. The breed of cattle is excellent. The coast is indented by numerous deep and spacious bays, of which Wigtown Bay, Luce Bay, and Loch Ryan are the chief. The surface is hilly, but the heights vary only from 400 to 900 feet. The chief rivers are the Cree and Bladenoch, both partially navigable. Generally the surface is better adapted for pasture than tillage, and a good deal of it is of very poor quality. It is divided into three districts—the Machars, comprising the broad-based triangular peninsula between Wigtown Bay and Luce Bay; the Rhinnas, comprising the peninsula formed by Loch Ryan and Luce Bay, terminating in the Mull of Galloway in the south and Corsewell Point on the north; and the Moors, or that bleak and barren part of the county north of the Machars and east of Loch Ryan. Pop. (1891), 36,062; (1901), 32,685.

WILBERFORCE, WILLIAM, a distinguished philanthropist, whose exertions to procure the abolition of the slave-trade gave him a high rank among the benefactors of the human race, was born at Hull, in Yorkshire, 24th August, 1759. After completing his education at St. John's College, Cambridge, he was in 1780 elected member of Parliament for his native town; and in 1784 he was returned both by his former constituency and by that of the county of York. He chose to represent the latter. In 1788 he made the acquaintance of Clarkson, who gained his sympathies on behalf of the agitation against the slave-trade, to which he henceforth devoted all his energies in Parliament till the agitation proved successful. He first called the attention of the house to the subject in 1787, and in 1791 he moved for leave to bring in a bill to prevent further importation of African negroes into the British colonies. Year after year he pressed this measure, but was always defeated till 1807, when it was passed during the short administration of Fox. But his exertions in the cause of the slave were not over. Having secured the abolition of the slave-trade in the British colonies, he next addressed himself to the task of obtaining emancipation for those already reduced to or born in slavery. In 1812, after having sat for Yorkshire in six Parliaments, he withdrew from the representation, and until 1825, when he retired from Parliament, he sat for the borough of Bramber as the nominee of his kinsman, Lord Carrington. He died on the 29th July, 1833, shortly after the government plan for the total abolition of slavery in the British colonies had passed in the House of Commons. His remains were interred in Westminster Abbey, and his funeral was attended by distinguished men of all parties. In 1838 his memoirs were published by his sons, in five vols. 12mo, containing extracts from his diaries, journals, and letters. Wilberforce was the author of a treatise entitled *A Practical View of the Prevailing Religious Systems of professed Christians in the Higher and Middle Classes contrasted with Real Christianity* (1797), and of one or two other works.

WILDEBAD, a watering-place of Wurtemberg, in the circle of Schwarzwald, romantically situated in the depths of the Black Forest, in a narrow valley on the Enz, 20 miles w.s.w. of Stuttgart. It consists of a long and narrow street, terminating in a square, in which are the celebrated thermal springs, with well-frequented baths. Pop. 3500.

WILD BIRDS' PROTECTION. Several acts of Parliament have been passed with the view of preserving wild birds from destruction within the United Kingdom. The first, which applies to certain wild sea-

birds, was passed in 1869 (32 and 33 Vict. cap. xvii.). The second act was passed in 1872 (35 and 36 Vict. cap. lxxviii.), and by it about eighty birds were protected, including a number of singing birds and various land and water birds, some of them important as food. This act being regarded as giving insufficient protection to certain birds forming important articles of food and commerce, an act for their further protection was passed in 1876, increasing the penalty. A fourth act was passed in 1880, coming into operation on 1st Jan., 1881, and repealing the previous acts. By the last act all wild birds are protected between 1st March and 1st August, certain of them mentioned in a schedule being prohibited to be killed or taken under a penalty of not more than £1 per bird, the others under a penalty of a reprimand and costs in the first instance, but for every subsequent offence 5s. for each bird and costs in addition. Any birds are allowed to be sold up to 15th March, or later if obtained from some person out of the United Kingdom. The birds enumerated in the schedule are: the American quail, auk, avocet, bee-eater, bittern, bonxie, colin, Cornish chough, coulteneb, cuckoo, curlew, diver, dotterel, dunbird, dunlin, eider duck, fern-owl, fulmar, gannet, goatsucker, godwit, goldfinch, grebe, greenshank, guillemot, gull (except black-backed gull), hoopoe, kingfisher, kittiwake, lapwing, loon, mallard, marrot, merganser, murre, nighthawk, nightjar, nightingale, oriole, owl, ox-bird, oyster-catcher, peewit, petrel, phalarope, plover, ploverspage, pochard, puffin, purr, razorbill, redshank, reeve and ruff, roller, sanderling, sand-piper, scout, sealark, seamew, sea parrot, sea swallow, shearwater, sheldrake, shoveller, skua, smew, snipe, solan goose, spoonbill, stint, stone-curlew, stonehatch, summer snipe, tarrock, teal, tern, thick-knee, tystey, whaup, whimbrel, widgeon, wild duck, willock, woodcock, woodpecker. This act was amended by 44 and 45 Vict. cap. li., which declares that no person offering for sale, or having in his possession, a wild bird recently killed, is liable to conviction if he satisfies the court that the bird was killed in some place to which the act does not extend. Acts of 1894 and 1896 (57 and 58 Vict. cap. xxiv., and 59 and 60 Vict. cap. lvi.) enable councils of administrative counties or county boroughs to obtain orders prohibiting (1) the taking or destroying of wild birds' eggs in any year or years in any place or places within the county; (2) the taking or destroying the eggs of any specified kind of wild birds within the county or any part or parts thereof; or directing (3) that the act of 1880 shall apply within the county or any part thereof to any species of wild bird not included in the schedule of that act. The penalty for taking or destroying eggs contrary to these orders is 20s. for each egg so taken or destroyed. The act of 1896 also gives the secretary of state power to extend protection to named species during the whole or any part of the period not dealt with by the act of 1880, and a special act of 1888 makes it illegal to kill, wound, take, or sell sand-grouse within the United Kingdom.

WILD HUNT, the name given in Germany to a confused noise supposed sometimes to be heard in the air at night, as if a phantom host were careering over woods, fields, and villages, accompanied with the shouts of huntsmen and the baying of hounds. The legends of the wild huntsman, called also hell-huntsman, vary in detail as much as they agree in essential points, and are sometimes closely connected with legends of the ancient gods, and sometimes with those of the mythical heroes. The main root of these myths is plainly discernible

in the everyday expression still heard in Lower Germany when there is a special commotion in the air: 'Wodan is hunting', that is, Wodan or Odin is advancing at the head of his battle-maidens (the Walkyries) and the warriors who had fallen in battle, accompanied by his wolves and also his ravens, bold animals, eager for the fray, which hovered about the combatants, and swept down upon the fallen. Although Christianity degraded the pagan gods to goblins and devils, the former attributes of divinity in all are yet clearly recognizable. Accordingly, as Odin, the ruler of heaven, the cause of atmospheric and weather phenomena, and thus of storms, was represented as riding on horseback clad in a broad-brimmed hat and a dark mantle, so also the wild huntsman appears mounted, and wearing the hat and mantle, but surrounded by companions of a totally different character: the spirits of drunkards, suicides, and other malefactors, who are often headless, or otherwise horribly mutilated. His hellish character is shown by the fact that when he reaches a cross-road he falls, and rises up at the other side. The wild huntsman seldom shows any kindness to the travellers he may meet. He usually causes injury or destruction, especially to those who recklessly invoke him, or who join in the shouts of the chase; only those who remain in the middle of the highway, or step aside into a sown field, or throw themselves on the ground in silence, escape the danger. His appearance is not restricted to a certain season, but he is most frequently seen about the twelve days between Christmas and Epiphany. The myth spread not only among the Germanic and Scandinavian races, but also among the peoples of France and Spain. In the various countries into which it was introduced, generally one of the national heroes took the place of Odin. Another form of the legend prevails in Thuringia and the country round Mansfeld. There the supernatural host, swelled with unbaptized children, and under the guidance of Frau Holla or Berchtha, was preceded by the trusty Eckhardt, an old man with a white staff, who called upon the people to move out of the way, that they might not receive any injury. See Grimm's Teutonic Mythology (Eng. trans., four vols., 1879-89), and Liebrecht's edition of the *Otia Imperialia* of Gervase of Tilbury.

WILFRID, St., an Anglo-Saxon prelate descended of a noble family of Bernicia (part of Northumbria), and born about 634; died at Oundle in Northamptonshire in 709. In 653 he accompanied Benedict Biscop to Rome, his special object being to get an authoritative answer to the question of the proper time for celebrating Easter (see EASTER). On his return he obtained from Alchfrid, king of Northumbria, a grant of land and a monastery at Ripon, and here he was ordained priest in 664. In this same year he took a leading part in the conference at Whitby, where he persuaded the king to decree that, in the celebration of Easter, the Roman usage should be substituted for that of the Scottish Church, which had hitherto prevailed in Northumbria. At this time also the king appointed him Archbishop of York, but having gone to France to be consecrated by a bishop holding the orthodox views on the Easter question, he found on his return that his see was occupied by one of the opposite party, and he did not succeed in getting possession of his see till 669. But his attempts to render the episcopal power superior to that of the king made him obnoxious to king Egfrid (who had succeeded Alchfrid in 670), and to reduce his influence the king divided his diocese into three, and when Wilfrid opposed this proceeding, deprived him of his see altogether (678). Wilfrid thereupon set out for Rome to obtain from the pope a reversal of the king's act of deposition. On his way thither he was instrumental in converting

the Frisians to Christianity, for, having been driven by a storm on the coast of Frisland, he preached to the people (who had no difficulty in understanding the Anglo-Saxon) with such effect that all the princes and many thousands of the people offered themselves for baptism. Having reached Rome he easily obtained from the pope the decision he desired, but during all the reign of Egfrid he lived under persecution or in exile; in 687, however, Aldfrid, who had succeeded Egfrid two years previously, reinstated him in his dignity. But Aldfrid also in course of time was offended by his devotion to Rome, and Wilfrid was again deposed in 691. He then made another journey to Rome, and on this occasion remained absent from England for many years, not returning till 705.

**WILHELMSHAVERN.** See **JADE**.

**WILHELMSHÖHE.** See **CASSEL**.

**WILKES, JOHN**, a political character of considerable notoriety, born in London in 1727, was the second son of an opulent distiller. In 1757 he was returned to Parliament as member for Aylesbury. In 1762 he attained considerable reputation by the publication of a paper entitled the *North Briton*, in which the administration of Lord Bute was severely attacked. These papers hastened the resignation of Lord Bute, which took place in April, 1763. In the same month appeared the famous No. 45 of the *North Briton*, which commented on the king's speech in such caustic terms that a prosecution was determined upon. The home secretary in consequence issued a general warrant, or one in which particular names are not specified, ordering the apprehension of the authors, printers, and publishers of the paper in question. On this warrant Wilkes, among others, was apprehended; but he asserted the illegality of the warrant, and refusing to answer interrogatories, was committed to the Tower. Some days after, he was brought by writ of habeas corpus before Chief-justice Pratt, of the common pleas, who ordered him to be discharged on the ground that his privilege as a member of Parliament had been violated. The same judge, on a subsequent occasion, declared such general warrants as that on which Wilkes had been arrested to be unconstitutional, illegal, and absolutely void. On the next meeting of Parliament, however, a special law was passed to sanction Wilkes' prosecution, and in Jan. 1764 he was expelled from the House of Commons. A second charge was also brought against him for printing an obscene poem, entitled an *Essay on Women*, and he was found guilty of blasphemy as well as libel. As he had by this time withdrawn to France and did not appear to receive sentence, he was outlawed, and thus the ministerial triumph was complete. He in vain made attempts to procure the reversal of his outlawry; but trusting to his popularity he ventured to return on a change of ministry (1768). He was elected to represent the county of Middlesex in Parliament, but before he could take his seat was committed to prison to fulfil the sentences previously passed upon him, and not long after was expelled from the House for an alleged libel upon the secretary of state and secretary at war. Three times after this he was re-elected within a few months, but the House of Commons persisted in keeping him out, and after the third election the other candidate, although he had got but a small minority of the votes, was declared duly returned. In 1770 he was released from his imprisonment. He was now more than ever the idol of the people, who lavished all kinds of favours upon him, even subscribing, it is said, £20,000 to pay his debts. He was elected alderman of London, sheriff of Middlesex, and finally mayor (1774). In 1774 he was again elected member of Parliament for Middlesex, and he was on this occasion allowed to take

his seat, which he held till 1790. His last triumph was obtained in 1782, when the resolutions respecting the disputed Middlesex election were ordered to be expunged from the journal of the House of Commons. From the year 1779 he held the lucrative office of chamberlain of the city of London. He died in December, 1797. Wilkes, as a writer and speaker, did not reach beyond mediocrity. His private character was very licentious, but he possessed elegant manners, fine taste, ready wit, and pleasing conversation. His *Letters and Speeches* were published by himself in 1786; and much light is thrown upon his conduct by the *Letters from the Year 1774 to the Year 1796* to his Daughter (1804, four vols. 12mo). His correspondence, in five vols., was also published, with a memoir by Almon, in 1805.

**WILKESBARRE**, a city of the United States, capital of Luzerne county, Pennsylvania, on the left bank of the North Branch of the Susquehanna, in a beautiful valley about 140 miles north by west of Philadelphia. It is well built, abundantly supplied with gas and water, and has an efficient tramway service. There are about 30 churches and chapels, numerous schools, a court-house, prison, opera-house, hospital, home for friendless children, historical and geological society, &c. It is the centre of a rich anthracite coal-field, and has manufactures of machinery, locomotives, cars, mining engines and tools, iron castings, ropes, brewery products, &c. There is ample rail and water communication with all parts of the States. Pop. (1890), 37,718; (1900), 51,721.

**WILKIE, SIR DAVID**, a celebrated painter, was the son of the minister of Cultra, near Cupar, Fifeshire, and was born there on 18th November, 1785. He received his first education in a school in the neighbouring village of Pittlesie, and afterwards in one in Kettle, but at neither of these was he distinguished as an apt scholar, the only occupation in which he was seen to take any interest being drawing. His bent for art being so decided his father procured for him a letter of introduction from the Earl of Leven to the secretary of the Trustees' Academy, an art seminary in Edinburgh, whither the young artist proceeded in 1799. Here he studied for several years, making considerable progress, and in 1803 gained the prize of ten guineas for the best painting on the subject of Calisto in the Bath of Diana. The following year he returned home and painted, for Mr. Kinnear of Kinloch, Pittlesie Fair, the first of that class of pictures for which he became afterwards so renowned. In 1805 he went to London, taking with him the picture of the Village Recruit, which, after standing for a while in the window of a frame-maker at Charing Cross, at length found a purchaser for £6. His first patron in London was William Stodart, the pianoforte-maker, who, among other introductions, gave him one to the Earl of Mansfield. This nobleman purchased from him his *Village Politicians*, a work which was exhibited at the Royal Academy in 1806, and excited universal admiration for its truthfulness and originality. It was succeeded by the well-known picture of the *Blind Fiddler*, painted for Sir George Beaumont, and among the works painted between this period and 1821 may be mentioned more especially the *Rent Day*, painted in 1807; *Blindman's Buff*, in 1813; *Distraint for Rent* in 1814; the *Penny Wedding*, painted for the prince-regent in 1818; the *Reading of the Will*, for the King of Bavaria in 1820; and the *Chelsea Pensioners*, commenced in 1817 and finished in 1821, for the Duke of Wellington. With this last picture the most brilliant period of Wilkie's artistic career was closed. Abandoning the peculiar style of art in which he stood unrivalled, he endeavoured to remodel his style by the study of the old masters, but

in seeking to impart to his subjects more of the quality of high art he failed in effecting his object, and at the same time lost the simplicity and truthfulness by which his former productions had been characterized. Among the most noted of the pictures of this last period are the Entrance of George IV. into Holyrood, the Spanish Council of War, and the Maid of Saragossa. In 1825 his declining state of health induced him to cross over to the Continent, where he remained for two years, visiting France, Switzerland, Italy, and Germany, and concluding his tour by again visiting Italy, along with the south of France and Spain. In 1836 William IV. created him a knight. Towards the end of 1840 a journey to the East, the motives for which have never been satisfactorily explained, was undertaken by him along with his friend Mr. Woodburn. The two reached Constantinople, and from thence in January, 1841, proceeded to Smyrna and Jerusalem, from which last place again they travelled in the month of April to Alexandria. On the 21st of May Wilkie embarked on board the *Oriental* steamer for England, but on arriving at Malta was attacked by fever, the symptoms of which, though at first mild, manifested themselves much more unfavourably after the vessel had resumed her voyage. He gradually sank, and expired off Gibraltar on 1st June. His body was committed to the sea on the evening of the same day.

Wilkie's pictures are so well known to the general public by the numerous engravings which have been published of them, that to attempt to describe them or enter into a minute criticism of his style would be an employment equally unnecessary and preposterous. The merits which characterize his works, at least his earlier ones, are their unrivalled truth and naturalness. They display a wonderful knowledge of and insight into human nature, combined with great judiciousness of grouping, minuteness of detail, and careful finish. In private life no one was more deservedly respected than Wilkie. He was a dutiful son, a warm and faithful friend, a hard-working student, and a good man.

WILKINSON, SIR JOHN GARDNER, a distinguished archaeologist, the son of a Westmoreland clergyman, born October 5, 1797; died at Wandsworth, October 29, 1875. He was educated at Harrow and Exeter College, Oxford. After leaving Oxford he resided twelve years in Egypt, and during his stay there made a thorough study of the ancient monuments of that country as well as of the languages and manners of the modern inhabitants. The most important fruit of these labours was a work entitled *Manners and Customs of the Ancient Egyptians* derived from a Comparison of the Painting, Sculpture, and Monuments still existing, with the Accounts of Ancient Authors (five vols. 1837-41). The work is very valuable not only for its text, but also for the numerous beautiful and accurate drawings with which it is enriched by the author. It still remains a standard authority on all that relates to Egyptian art. His later works about Egypt are of a more popular character. Among them are *Modern Egypt and Thebes*, afterwards abridged and published by Murray as a *Handbook for Travellers in Modern Egypt*; *A Popular Account of the Ancient Egyptians*; and *The Egyptians under the Pharaohs*, forming a supplement to the previous work. His principal other works are *Dalmatia and Montenegro* (1848), the result of a journey in these regions, and on *Colour and on the Necessity of a General Diffusion of Taste among all Classes* (1858). The honour of knighthood was conferred on Wilkinson in 1839. The collections made by Sir Gardner Wilkinson have partly gone to increase the stores of the British Museum, but a considerable proportion of them was presented to Harrow

for the purpose of founding a museum in connection with the school.

WILL, in man, the function by which he is able to give movement to his limbs and direction to his thoughts, and it may be to increase or diminish the intensity of his feelings. A man's control over his members is limited only by his physical structure, by external force, and by disease. His control over his thoughts is not so absolute, and that which he exercises over his feelings is more limited still. Everybody knows that he has in a greater or less degree the power of fixing his attention and keeping it fixed on what subjects he pleases, and most people are familiar with the fact that this power is not unfailing in its action. The power of the will over the feelings is in general greater in repressing or moderating than in exciting or intensifying them.

From a very early period in the history of philosophy there has been a strange dispute as to whether the human will is free or governed by an irresistible necessity. To the ordinary understanding unacquainted with philosophical discussions freedom appears to be involved in the very idea of will, and consciousness appears steadily to confirm this first view. Yet the question has been agitated among philosophers for more than two thousand years, and seems destined to continue a subject of dispute for ever; and the singular thing is that the advocates of both sides of the question mostly make a direct appeal in support of their views to consciousness. Aristotle seems to have been the first philosopher who considered it necessary to make any statement regarding the matter. In one passage of the *Nicomachean Ethics* he incidentally asserts the freedom of the will as a presupposition of morality, but in that work he does not discuss the question. The Stoics and Epicureans also agreed in affirming it. The early Christians had some difficulty in reconciling human free-will with divine foreknowledge, but usually the freedom of the will and its compatibility with the foreknowledge of God were maintained. Justin Martyr (flourished 150 A.D.), Irenæus, Clemens Alexandrinus, Origen, Gregory of Nyssa, and St. Augustine are among the chief of those by whom the question was discussed, and by all of them it was decided in the manner just stated. The only class of Christians by whom the freedom of the human will was denied was the Gnostic heretics. The question has been very actively discussed since the revival of philosophy in modern times. Spinoza denied human free-will, but asserted the divine free-will in the sense of will determined only by the nature of the divine being. Leibnitz asserted the freedom of the human will, which was also done by his contemporary Dr. Samuel Clarke; and among the leading upholders of the same view since their day are Reid, Stewart, Kant, and Hamilton; while the principal advocates of the doctrine of necessity are Hobbes, Hume, Jonathan Edwards, J. S. Mill, &c. By Jonathan Edwards the doctrine of necessity was upheld not only as a philosophical tenet, but as a part of his religious creed, being regarded by him as a legitimate corollary of the Calvinistic theology. This view is not, however, generally held by Calvinists, most of whom are assertors both of the doctrine of free-will and of that of the divine foreknowledge and that of election. Such is the teaching, among other Calvinistic works, of the Westminster Confession of Faith.

There is one thing obvious with regard to this controversy, that it cannot relate to free-will in the ordinary popular sense of the term. In ordinary speech no one would think of denying that a man who performs an action voluntarily and intentionally acts of his own free-will; and a person is said not to

act of his own free-will only when his action is involuntary or unintentional; or when it is due to physical force external to himself, that is, when the action is properly speaking not his action at all; or lastly, when he acts under a degree of moral constraint imposed by others that is looked upon as irresistible. Popular speech thus recognizes freedom of the will in all cases in which a person may act as he pleases: it makes use of the expression so often in the mouths of metaphysicians and theologians, but it does not distinguish between the liberty of the will and the liberty of the agent. Now, as it is impossible for any one, even the subtlest or most sophisticated of metaphysicians, to deny the possibility of a free agent in the sense of a person at liberty to act as he chooses, it is quite clear that the popular use of the expression free-will could never have given rise to any controversy, and that something else must be meant by the words when metaphysicians discuss whether the will is free or not; from which it follows that it is vain to point to any fact incompatible with the denial of free-will in the popular sense as an objection to the philosophical theory that denies the freedom of the will; it is useless, for example, to insist with this object upon the fact that a man when he did one thing was quite at liberty to do the opposite thing if he had chosen.

The popular sense of free-will being, then, different from the metaphysical one, the question arises, What is the metaphysical one? and it would hardly be too much to say that the main difficulty in connection with the problem consists in answering this question. Without using such words as 'contingency,' 'self-determination,' &c., words so vague as to be consistent with any theory of the will, it is scarcely possible to state the contentions of the two parties to the controversy in language that will be accepted by both. Yet we will venture to lay down the ground of discussion in this way. Those who deny the freedom of the will, and who are called Necessitarians or Necessitarians, Determinists, and so forth, maintain that even when a man does what he likes, his volition or voluntary act is always the immediate consequence of his nature and circumstances at the time that the action is performed; while those who assert the freedom of the will, and who are generally called Libertarians, aver that this is not the case. In other words, the Necessitarians contend that a man always acts from the strongest desire in regard to the end of action or inaction that happens to possess him at the time of action, and this is what they mean by saying that his will is not free. If, then, the Libertarians assert the freedom of the will in the same sense that the Necessitarians deny it, they must admit that a man shows the freedom of his will only when he does not act from the strongest desire that happens to possess him at the time of action, and they must contend that he may do so. In the metaphysical sense of the word, then, a man establishes the freedom of his will only in two ways; either by doing one thing when he desired more strongly to do another thing, or by acting in a certain manner when he had absolutely no desire whatever in regard to action or inaction in the particular case. Now, who that considers the meaning of the words used, and attends to the processes of his own mind, does not see that neither of these actions is properly speaking an action at all, that the only actions that have a right to the name, the only actions that have a moral quality, are those which are performed from the strongest desire, those which are the immediate consequence of the nature and circumstances of the agent at the instant of their performance? The very meaning of the word will is action according to the strongest desire, that is, in the metaphysical sense,

necessary action; and in this sense it is as absurd to talk of a person acting freely as it is to talk of a light that does not illumine.

Yet it may be conceded that the feeling that this account of the phenomena of volition in an intelligent being is incomplete and unsatisfactory is a natural one, and hence it happens that Libertarians no less than the advocates of the opposite doctrine appeal to consciousness in support of their view. The mind, they say, determines, or may determine, our volitions, and of this we are all conscious. Well, certainly; it is the mind that apprehends the objects of desire, and the mind that is influenced by desire, which is not a mere physical affection beyond consciousness; and hence it may be said very truly that the mind determines our volitions. But this cannot be all that is meant by those who see in this fact a ground for asserting a freedom of the will over and above the freedom of the agent to do as he likes. What, then, is meant? This, perhaps: that man as an intelligent being has the power of reviewing his conduct both past and future, and of forming purposes regarding his action in future either in general or in a particular instance, determining to act in a certain manner whatever impulses there may be prompting him to act otherwise. Now this is a fact unquestionably, and an important fact; one of the features of our nature that make us morally responsible beings. But it does not at all invalidate what has been already said as to volition being always the result of the strongest desire. Purposes are nothing until they are seized hold of by desire. General principles of conduct are not so for us until we desire to obey them, and indeed the power of forming purposes is nothing else than the fact that such desires may (and do) arise in us. Whether we do act in accordance with our deliberate purposes, or not, depends upon whether our desire to do so is stronger or weaker than the impulses that may chance to spring up when there is occasion for doing so.

It is no doubt due to a perception of this fact that some thinkers, without discussing or attempting to discuss the contingency of human volition, or the mind's power of self-determination, have defined the freedom of the will as consisting in this faculty of viewing our conduct intelligently, and governing it more or less by purposes, or have expressed themselves in such a way as to show that they deem this prerogative of intelligent beings the most important fact in connection with the will. Thus Aristotle says that 'freedom exists whenever the will of the agent meets no obstacle, and he is able to deliberate intelligently. It is destroyed by ignorance or constraint.' Thomas Aquinas says that 'necessity arising from internal causes and reposing on knowledge is freedom.' Herbart defines freedom of the will as consisting in 'the assured supremacy of the strongest masses of ideas over single affections or impressions.' 'The idea of internal freedom,' he adds, 'is founded on the satisfaction arising from harmony between the will and our judgment respecting the will.' Trendelenburg expresses himself thus: 'The ability to have for its motive, in opposition to the desires, and independently of sensuous motives, only the good as apprehended in thought, this we term freedom of the will.' It is evident that by 'the desires' in this last definition must be meant the lower desires only, for it is impossible to believe that Trendelenburg could speak or think of a will having the good for its motive unless he conceived the agent to be animated by the desire of the good.

Kant, Schelling, and Sir William Hamilton have taken up singular positions on the question of the freedom of the will. They all acknowledge to a certain extent the force of the Necessitarian argu-

ments, but each of them has his own method of evading the conclusion towards which those arguments tend. Kant does so in making a distinction, in keeping with the rest of his philosophy, between the will as a phenomenon, namely, in its overt actions, and the will as a 'thing in itself.' In the former sense he feels bound to admit that the will is subject to the law of causality, and is accordingly not free, but in the latter sense he holds that the will may be thought as free without contradiction. To show next that the will as a thing in itself actually is free he appeals to what he calls practical reason, asserting that the categorical imperative, as he calls it, of the moral law implies ability in those who feel that law in their nature to obey it, and therefore implies the freedom of the human will. It is thus clear that Kant considers something more than free-will in the popular sense to be necessary to constitute a morally responsible being. Into this question it would be impossible for us to enter without having at our disposal ten times as much space as can be afforded for this article in a work like the present; and we can therefore only hope that it will not be deemed rash in us to believe that a sound philosophy will agree with the common sense of mankind in pronouncing every man morally responsible for all the actions that he voluntarily and intentionally performs. Schelling's account of free-will is this: 'The freedom of man was exercised in an 'intelligible act' done before time, and through which he made himself what he now is; man, as an empirical being, is subjected in his actions to necessity, but this necessity rests on his own non-temporal self-determination.' This utterance is itself perhaps a good deal in need of interpretation; but it seems to state essentially the same doctrine as that of Kant, at least as the latter was interpreted by J. S. Mill. Sir W. Hamilton's views on free-will form part of his philosophy of the conditioned. He grants that we are unable to conceive a free volition, but contends that this is only one of two contradictory inco conceivable, one of which must be true, the other being that of a will determined by an infinite series of causes. After endeavouring to make this tenet good he manages, in spite of his admission of the inco conceivable of a free volition, to appeal to the testimony of consciousness in support of the doctrine that this is the one of the two inco conceivable which is true. (Our citations are mainly taken from Ueberweg's *History of Philosophy*; English ed., Lond. 1872.)

**WILL, or TESTAMENT**, in law, is defined as 'the legal declaration of a man's intentions of what he wills to be performed after his death.' Among the Anglo-Saxons the practice of devising lands prevailed to some extent (Spelman *On Feuds*, cap. v.; Wright's *Tenures*, p. 171); but after the Conquest lands held by feudal tenure were not devisable, with the exception of burgage tenures. Lands held in gavel-kind, however, as were, for the most part, those of the county of Kent, were devisable. After some changes in the laws in this respect in England a statute was passed in the beginning of the reign of Charles II. which gave a general power of devising whatever interest or estate the testator had in lands. The law that now applies to all wills made in England after the 31st of December, 1837, is mainly contained in act 7 Will. IV. and 1 Vict. cap. xxvi.

**Persons Capable of Making a Will; Property Devisable by Will, &c.**—To make a valid will in England, the testator must be of sound mind, and must be of the age of twenty-one years. In some of the States of the American Union persons aged eighteen may bequeath personal estate; in other states the testamentary capacity for lands even is reduced to that age. A person born deaf and dumb is presumed to

be incapable of making a will; but if it can be proved that he understands the nature of the act, he may make known his will by signs and tokens. A blind person must be proved to have known the contents of, and given his approval to, any will attributed to him. In England, previous to January, 1883, married women, unless under certain conditions, could not dispose of either real or personal property, but they have now the same power as that held by single women. In this respect the American law is essentially the same. Devises of lands or tenements, or money to be laid out therein, to corporations, except for certain charitable uses, are not authorized. (See *MORTMAIN*.) Money or other personal property may be left by will to works of charity, but it must not be directed to be laid out in land. Though a person may dispose by will both of his real and personal property, yet in respect to real estate the general doctrine up to the date of the coming into operation of the act above cited, was that a devise of real estate would operate only on the property of which the testator was possessed at the time of making the will, but now the right of the testator to devise by will all the real estate that he may acquire up to the time of his death is put beyond question. Formerly oral or so-called nuncupative wills were valid under certain restrictions with reference to personal estate; but now all wills, except those of soldiers in active service and sailors at sea, must be written and attested by two witnesses. Legacies to witnesses are void, as also legacies to the husband or wife of a witness. A codicil is a supplement to a will, and requires to be made with similar formality.

**Execution of a Will.**—It is a general rule that wills, to operate on lands, must be executed according to the laws of the place where the lands lie; but personal property passes by a will executed according to the laws of the place of residence of the testator, though the property be situated elsewhere. This distinction arises from the general rule that the title to lands is to be governed by the laws of the country where it is situated, but that personal property is subject to the contracts and disposition made by the owner, in conformity to the laws of the place where they are made.

**Revocation.**—A will may be revoked by an instrument of equal formality, or by cancelling. A subsequent will, accordingly, is a revocation of a prior one, if its provisions imply a substitution of the latter will for the former. But the more general rule is, that if a subsequent will is invalid, it will not be a revocation of a preceding one; and the general rule again is, that by a revocation or cancelling of a subsequent will, a preceding one is revived. A will may also be revoked by the marriage of the testator.

**Construction.**—It is a general rule that wills are to be construed liberally, and as far as is practicable so as to fulfil the intention of the testator. In this respect a greater liberality is adopted than in regard to deeds and most other written instruments. With regard to the devise of any real estate it was formerly held that the devisee was only entitled to a life estate, unless it would be gathered from the will that a greater estate was intended to be devised; but now the rule followed is the reverse, and such a devise is held to transfer to the devisee all the interest that the testator had in the estate bequeathed, unless a contrary intention appear from the will.

In England the ecclesiastical courts formerly exercised jurisdiction in all matters relating to wills, but in 1857, by act 20 and 21 Vict. cap. lxxvii. (amended by 21 and 22 Vict. cap. xov., and later acts), this jurisdiction was transferred to a special court called the Court of Probate. See *PROBATE, COURT OF*.



In Scotland any person can execute an effectual testament who is of sound judgment at the time, although suffering from sickness, or even on his death-bed; a wife may make a will without the consent of her husband; so also may a minor—that is, a person between the ages of fourteen (if male) or twelve (if female) and twenty-one; but a pupil—that is, a person under the age of a minor, cannot make a valid testament. But even respecting personal estate a testator cannot effectually dispose by testament of more than that portion of it termed 'the dead's part'; thus, a testament which encroaches on the *jus relicta* or *legitim* may be reduced at the instance of the widow or children in so far as they are interested. (See LEGITIM.) A testament containing the nomination of an executor, or the bequest of a legacy above £100 Scots, must be properly tested and signed before witness, but if it is holograph no witnesses are required. If the testator cannot write, a single notary or justice of the peace, or the minister of the parish, may subscribe for him before two witnesses. Previous to the 31st December, 1868, a testament was effectual only with regard to the movable estate of the testator, while a will affecting heritable property could only be made by way of a *deed* or *disposition*, conveying the property to the donee, but reserving the testator's liferent; but by an act which came into operation at that date it is competent to any owner of land to settle the succession to the same, in the event of his death, either by the old legal forms or by testamentary or *mortis causa* deeds or writings, so that heritage is now placed in the same position as movable estate with regard to settlement by will.

WILLENHALL. See WOLVERHAMPTON.

WILLIAM I., surnamed the *Conqueror*; King of England and Duke of Normandy. He was born in 1027 or 1028, and was the natural son of Robert, duke of Normandy, by Arletta, the daughter of a tanner of Falaise. His father, having no legitimate son, when about to set out on a pilgrimage to Jerusalem, nominated him as his heir. Robert died in 1035, while returning from Palestine; and Normandy fell for a time into a condition of anarchy. When William assumed the reins himself, his vigour and ability soon restored order, and his power increased so much as to excite the jealousy not only of the surrounding nobles, but of his suzerain the King of France himself. Two combinations were formed against him, and twice his territory was invaded; but he repelled these aggressions, and reduced the French king to the necessity of peace. The opportunity of gaining a wider dominion presented itself on the death of his second cousin, Edward the Confessor, king of England. When this event took place he laid claim to the English crown, alleging that Edward had bequeathed it to him. To enforce his claim he invaded England, and the victory of Hastings, in which his rival Harold was killed, ensured his success (1066). On the Christmas-day of the same year William was crowned, after a sort of tumultuary election on the part of the English nobles, and took the customary coronation oath. His first measures were mild: he sought to ingratiate himself with his new subjects, preserved his army in strict discipline, confirmed the liberties of London and other cities, and administered justice impartially. On his return to Normandy, however, the English, being treated by the Norman leaders like a conquered people, broke out into revolt, and a conspiracy was planned for the massacre of all the Normans in the country. On this intelligence William returned, and began with a show of justice by repressing the encroachment of his followers; but on his reviving the Danegelt, which had been abolished by Edward the Confessor, the discontents were renewed. These

he repressed with his usual vigour, and a temporary calm succeeded. The resistance of two powerful Saxon nobles, Edwin and Morcar, who had formed an alliance with the kings of Scotland and Denmark, and with the prince of North Wales, soon after drew William to the north, where he obliged Malcolm, king of Scotland, to do homage for Cumberland. From this time he treated the English like a conquered people, multiplied confiscations in every quarter, and forced the native nobility to desert the country in great numbers. In 1069 another formidable insurrection broke out in the north, and at the same time the English resumed arms in the eastern and southern counties. William first opposed the storm in the north, and executed such merciless vengeance in his progress that the whole country between York and Durham was turned into a desert; and above 100,000 of both sexes and all ages are said to have perished. There being now scarcely a landed proprietor who had not incurred the forfeiture of rebellion, he put into execution his plan of introducing a total alteration of the state of English law and property, by dividing all the lands into baronies and adopting the feudal system in regard to land tenure and services. He also reduced the ecclesiastical property to a similar system, and, to prevent resistance from the clergy, expelled most of the English Church dignitaries, and placed Normans or other foreigners in their stead, Lanfranc being made archbishop. Still further to subjugate the minds of the English, he caused French to be used in the courts of justice and in law proceedings, and ordered it to form a leading part of instruction in all the schools throughout the realm. In 1076 he received a demand from Pope Gregory VII., requiring him to do homage for his kingdom, and to pay the accustomed tribute from England to the holy see. William denied the homage; nor would he allow the English prelates to attend a general council summoned by Gregory, but consented to the levy of Peter's pence. Towards the end of his reign he instituted that general survey of the landed property of the kingdom, the record of which still exists under the title of Domesday Book (which see). The manner in which he laid waste a large district in Hampshire, where he demolished villages, churches, and convents, and expelled the inhabitants for 30 miles round, merely to form the New Forest for hunting, exhibits his callousness and love of the chase, which he further protected by a most severe code of game-laws. In 1087 he went to war with France, whose king had encouraged a rebellion of Norman nobles. He entered the French territory, and committed great ravages, but, by the starting of his horse at Mantes, received an injury which caused his death, which took place at the abbey of St. Gervais, near Rouen (1087). He left three sons—Robert, to whom he bequeathed Normandy; William, who inherited England; and Henry, who received but his mother's property. He also left five daughters. William the Conqueror was the most powerful sovereign of his time. He possessed superior talents, both political and martial, and employed them with remarkable vigour and industry. His passions were, however, strong; his ambition severe and merciless; and his love of sway often led him to disregard all restraints of justice and humanity. See Lappenberg's *England under the Anglo-Norman Kings*, Freeman's *History of the Norman Conquest of England*, and Stubbs's *Constitutional History of England*.

WILLIAM II., surnamed *Rufus* from his red face, third son of the preceding, was born in Normandy about 1060. Being nominated King of England by his father, on the death of the latter he

hastened over from Normandy, took possession of the royal treasury at Winchester, and was crowned at Westminster on the 26th of September, 1687. The division of England and Normandy did not, however, please the great barons, who possessed territories in both; and a conspiracy was formed for effecting the deposition of William in favour of his brother Robert; but the conspiracy was repressed with great vigour; the confederate nobles were forced to withdraw to Normandy, and their English estates were confiscated. Being now firmly seated on his throne, he forgot his promises to the English; and the death of Lanfranc, Archbishop of Canterbury, freeing him from an authority which he respected, he extended his rapacity to the church, and seized the temporalities of vacant bishoprics and abbeys, to which he delayed appointing successors. In 1690 he made an incursion into Normandy, to retaliate on his brother Robert; but a reconciliation was effected between them. In 1696 Robert mortgaged his dukedom to William for the sum of 10,000 marks to enable him to fit out an expedition and join the crusaders in the Holy Land. William accordingly took possession of Normandy and Maine, although in the case of the latter he was not allowed to do so without a struggle, inasmuch as the inhabitants had adopted the lord of La Flèche, a nephew of their old count, as their master. William II. met his death while hunting in the New Forest. His body was found pierced by an arrow, which is generally believed to have been shot, whether accidentally or purposely cannot be said, by a French gentleman named Walter Tyrrel. Tyrrel immediately galloped to the coast, and embarked for France, where he joined the crusaders. The body was interred without ceremony at Winchester. This event took place August 2, 1100, when William was in the fortieth year of his age, and thirteenth of his reign. This prince possessed vigour, decision, and policy, but was violent, perfidious, and rapacious. See Freeman's *Norman Conquest of England*, and his *Reign of William Rufus*.

**WILLIAM III.**, hereditary stadtholder of Holland and king of England, son of William II. of Nassau, prince of Orange, was born at the Hague on the 4th of November, 1650. His mother was Henrietta Mary Stuart, daughter of Charles I. of England. Possessing superior talents, and educated in an excellent manner by the grand pensionary John De Witt, he gained the love of the people, who in 1672, when Louis XIV. invaded the republic, appointed him at once captain-general, grand-admiral, and stadtholder of the United Provinces, after enforcing the abrogation of a resolution which De Witt had got passed in 1667, and which declared that in future no captain-general should at the same time be stadtholder. It is impossible to acquit William of all blame in connection with the massacre by a furious mob of John and Cornelius de Witt, the leaders of the party that had at this time incurred general hatred by showing a disposition to make peace with France. The massacre may not have been planned by him as some believe, but he did nothing to prevent it, and when it was accomplished he protected and rewarded the ringleaders. William's management of the war against France was masterly. In the campaign of 1678 he opened the sluices in the dykes round Amsterdam, thus causing the whole of the neighbouring district to be inundated and forcing the French to retire. In subsequent campaigns he lost, indeed, the battle of Senef in 1674, and that of St. Omer in 1677; but he was, nevertheless, able to keep the enemy in check, and by his policy engaged the empire, Spain, and Brandenburg to take part with Holland, so that at the Peace of Nijmegen in 1678 the integrity of Holland was respected. In the course of

this war he was proclaimed hereditary stadtholder first by the provinces of Holland and Zealand, then by those of Gelderland, Utrecht, and Overijssel (1674). William's whole policy was directed against Louis XIV., for whom he entertained a personal hatred. To curb the ambition of the French monarch he instituted the league of Augsburg, July, 1686, between the emperor, Spain, Sweden, and Holland, to which Denmark and some German princes also acceded. Perhaps he may have had the further object of giving effect to his plans with respect to England. His wife, Mary (married in 1677), was the daughter of James II., and presumptive heiress to the throne. Unexpectedly James's second wife gave birth to a son, June 10, 1688. The greater part of the Parliament and of the nation now feared that the bigoted James would introduce the Catholic religion, and subvert the constitution. Rumour also asserted that the prince was supposititious. The Episcopalians and Presbyterians in England, under these circumstances, united, in order, by the aid of Holland, to give Mary the succession to the throne. William foresaw that England, by the policy of his father-in-law, would become more and more closely connected with France: he therefore joined with the great majority of the British nation; and the pensionary Fagel persuaded the states-general to support him with ships and troops for the preservation of British freedom and the Protestant religion. William arrived suddenly at Torbay, Nov. 5, 1688, with a fleet of 500 sail, ostensibly equipped against France, and with 14,000 troops. Upon his landing a great part of the nobility immediately declared for him; and James's soldiers by degrees went over to him. In December the king fled with his family to France, after which William made his entry into London. The two houses of Parliament in convention now declared that James II. had broken the fundamental compact between the king and the people, and by withdrawing from the kingdom had abdicated the government. After this (Feb. 13, 1689) Mary was proclaimed queen, and William, her husband, who had meanwhile gone over to the English Church, was proclaimed king, and was alone to conduct the administration. At the same time the declaration or bill of rights (see *BILL OF RIGHTS*) settled the limits of the royal power, and the order of succession. Scotland followed England's example; but in Ireland, whither Louis XIV. sent James with an army, the majority of the Catholics maintained the cause of the deposed king. But the victories gained by William over the army of James on the Boyne, July 1, 1690, and by his general Ginkell at Aughrim, July 13, 1691, assisted by the clemency with which he treated the vanquished party, made him master of Ireland. In the war on the Continent he was less successful. At Steinkirk he was defeated by Marshal Luxembourg in 1692, and at Neerwinden by the same general in 1693; but he always succeeded in wresting from the French the fruits of their victories by skilful retreats and marches. He even took Namur in 1695, in the sight of a superior hostile army. Louis was finally compelled to acknowledge him as King of England at the Peace of Ryswick, in 1697. The Parliament insisted at that time on the disbanding of nearly the whole army, because it deemed a standing army incompatible with the security of the constitution. Soon after, the will of Charles II. of Spain, who had made the grandson of Louis XIV. his heir, induced William to arm all Europe against Louis in the great alliance of the Hague, September 7, 1701. But in the midst of these projects he broke his collar-bone by a fall from his horse between Kensington and Hampton Court, Feb. 21, 1702, and died in consequence of the accident, March 8. His wife, Mary,

had already died childless in 1694. The Orange possessions were divided between Prussia and William's nearest cousin and testamentary heir, John William Friso, the prince of Nassau-Dietz, hereditary stadtholder of Friesland and stadtholder of Gröningen, from whom the present King of Holland is descended. William's manners were too cold and ungracious to allow him to be popular with the British. Under a reserved exterior he concealed a strong love of renown and power. To obtain the majority of votes in Parliament he made use of bribery. Otherwise he reigned in the spirit of freedom and tolerant Protestantism, and agreeably to the true interest of the nation. Immersed in politics and war, he had neither leisure nor inclination for literature and art. In conversation he was grave and unattractive; but in business, penetrating, quick, and decided; in danger, undaunted; in difficulties, unshaken; in war, bold without ostentation. See Bishop Burnet's History of his Own Times; Macaulay's History; Hallam's Constitutional History; Ranke's History of England; Traill's William III. (1888); &c.

**WILLIAM IV.**, King of the United Kingdom of Great Britain and Ireland, was the third son of George III., and was born August 21, 1765. From 1779 to 1790 he served in the navy, and after quitting active service was raised successively to all the higher grades of naval command, till in 1801 he was made admiral of the fleet. In 1789 he was raised to the peerage with the title of Duke of Clarence. He frequently spoke in the House of Lords, and during the Canning administration held the office of lord high-admiral (1827-28). On his accession to the throne (June 28, 1830) he retained the ministers who were in office at the decease of his predecessor (the Wellington cabinet), with assurances of his confidence in their zeal and ability. In the new Parliament, which met in November, the ministry, being left in a minority on a motion of Sir H. Parnell for referring the civil list to a select committee, immediately sent in their resignation; and a Whig administration was formed with Earl Grey at its head. The great events which will render the reign of William IV. memorable are the passage of the reform act, the abolition of slavery in the colonies, and the reform of the poor-laws. William IV. died on the 20th June, 1837, and was succeeded by his niece, Victoria. He married in July, 1818, Adelaide, sister of the Duke of Saxe-Meiningen, by whom he had no surviving children. He had, however, a large family by Mrs. Jordan the celebrated actress, who was for many years his mistress, while Duke of Clarence. This lady had already had four children as the result of a similar loose connection. Her liaison with the duke lasted from about 1790 till 1811, when an arrangement was made by which she and her family were well provided for. She died in France, in 1816.

**WILLIAM I. THE YOUNGER**, Count of Nassau, Prince of Orange, surnamed 'The Silent' on account of his prudence and caution in diplomacy, the founder of Dutch freedom, was the eldest son of William the Elder, count of Nassau, and Juliana, countess of Stolberg, and was born April 16, 1533, at the Castle of Dillenburg, in the county of Nassau. He was educated in the Roman Catholic faith by Maria, queen of Hungary, sister of Charles V., and spent nine years in attendance on the person of the emperor, who had so high an esteem for the spirit, the prudence, and intelligence of the prince, that he asked his opinion respecting the most important matters, and when he was but twenty-two years old intrusted him with the chief command of the army in the Netherlands, in the absence of Philibert, duke of Savoy. He also recommended him to his successor,

Philip II., who, however, regarded him with distrust. As Cardinal Granvella had now the entire confidence of the king, and Margaret of Parma, who was charged with the government of the Netherlands, was obliged to do whatever this proud and ambitious prelate suggested, especially with respect to the introduction of the detested Spanish inquisition, and the erection of new bishoprics, the Count of Egmont, the Prince of Orange, and the Count of Horn represented to the king in writing, that unless the cardinal was speedily recalled, his violence would drive the country to rebellion. Philip looked on this step as treason; yet he concealed his anger, and recalled the cardinal (1564). After the remonstrance offered in 1566 by 800 noblemen (the Gueux), with Count Louis of Nassau, the brother of William, at their head, against the introduction of the inquisition and the establishment of new bishoprics, had been rejected with contempt, and the Duke of Alva had been appointed at the head of an armed force governor of the Netherlands, William had a meeting with Egmont, Horn, his brother Louis, and others at Dendermond, to deliberate on the means of averting the threatening danger. The majority advised an armed resistance, but this proposal came to nothing on account of the opposition of the Count of Egmont. The prince, with his wife and his children, excepting the eldest, who was studying at Louvain, repaired to Breda, whence, however, he removed to his castle at Dillenburg. Alva arrived in the Netherlands in 1567, and many men of consequence, including Egmont and Horn, were immediately arrested. In the beginning of 1568 he caused the prince and others, who had retired from the country, to be summoned before the council of twelve. The prince did not appear, in consequence of which Alva declared him an outlaw, confiscated his property, and removed his son Philip William, then thirteen years of age, from the University of Louvain, and sent him as a hostage to Spain. The Prince of Orange now determined on waging war against Alva. In a document which he issued in the summer of 1568, and called his 'justification,' he gave the reasons of his conduct and publicly professed the Protestant religion. In consequence of this he received aid in money and troops from several Protestant princes. With the army which he had raised, his brothers Louis and Adolphus invaded Friesland, but gained only a temporary success. William now raised a new army of 24,000 Germans, who were joined by 4000 French soldiers, and personally took the field. He conducted his forces with great skill across the Rhine and Meuse, entered Brabant, and defeated a division of the hostile army, but was unable to bring the Duke of Alva, who threw himself into the fortresses, to an engagement, or to excite the people, who trembled before the Spaniards, to a general insurrection. His army now dispersed. He himself, with 1200 cavalry, and his brothers, repaired to the Duke of Deux Ponts, and took part in his expedition to France against the Catholic party of the Guises (1569). In this expedition he distinguished himself in several battles and sieges; but after the unhappy termination of the campaign, returned to Germany. In France Admiral Coligny had advised him to fit out privateers against the Spanish, and establish himself particularly in Zealand and Holland, from which the Spaniards would hardly be able to drive him. The prince followed this advice, and the privateers made themselves masters, in 1572, of the town and harbour of Briel, on the Island of Voorn, and also took Flushing. As Alva's tyranny became more intolerable, and the people were exasperated by new exactions, several cities of Holland, Zealand, Overijssel, and Gelderland publicly declared for the Prince of Orange. Relying on the assistance of

France, which Admiral Coligny had promised to obtain for him, William crossed the Rhine, but on the news of the massacre of St. Bartholomew, which deprived him for the time of all hope of French aid, he was obliged to disband his troops, whom he was unable to maintain. He retired into the province of Holland, which always continued steadfastly to support him. He now resumed his negotiations with France, and obtained a treaty in which France promised to support him, provided that it should receive the protectorate over all the provinces of the Netherlands, which he succeeded in wresting from the Spaniards. At the end of 1573 Alva was recalled and replaced by Requesens, who was unable to assume the offensive owing to the exhaustion of the treasury. In 1574 Louis and Henry of Nassau, William's brothers, made an effort to join him, but were totally defeated by Requesens at Mookerheide, near Nijmegen. Both of William's brothers fell on the field of battle. This blow was compensated by the relief of Leyden, at that time hard pressed by the enemy. The raising of the siege of Leyden saved the province of Holland for the time, but the Spanish were still formidable, and daily gathered strength. William in vain endeavoured to gain allies, and Holland might have been completely crushed had it not been for the death of Requesens, which took place in March, 1576. After this event the Spanish soldiers at Antwerp and other places committed such outrages that William succeeded in bringing about the so-called pacification of Ghent (Nov. 8, 1576), in which almost all the provinces of the Low Countries united to expel the foreign troops, and promised mutual toleration in matters of religion. The new stadtholder, John of Austria, a natural brother of the king, sought to break the force of the union by granting, in the perpetual edict, almost all the demands of the people (1577), but his conduct soon manifested his insincerity. The states of Antwerp then called the Prince of Orange to their aid. The people received him with acclamations in Brussels. A part of the estates offered him the stadtholdership; but as several nobles were opposed to him, he allowed them to offer the dignity to Archduke Matthias of Austria, brother of the emperor, while he himself was appointed to the rank of lieutenant-general. The war was now renewed, and by the victory at Gemblours in the end of January, 1578, the Spaniards recovered their superiority in the Walloon provinces, which were zealously Catholic. In 1579 Don John of Austria died, and the king appointed Alexander Farnese of Parma as his successor. The policy of Farnese succeeded in gaining over to the king the southern provinces, which were dissatisfied with the religious peace and the political equality of the two churches. The prince, therefore, brought the five northern provinces, Holland, Zealand, Utrecht, Gelderland, and Friesland, into closer connection by the union of Utrecht, January 23, 1579, and thus laid the foundation of the republic of the United Netherlands. In 1580 the king, finding it impossible to triumph over William by fair means, put a price upon his head. This step induced the united provinces to renounce their allegiance to Philip, and William was offered the dignity of sovereign count of Holland and Zealand, which he accepted. But the edict of Philip proclaiming a reward for his life was not without effect. In 1582 an attempt was made by a Spaniard named Jaureguy to assassinate him at Antwerp, and a second attempt, made at Delft on the 10th of July, 1584, by a Burgundian fanatic Balthasar Gerard, succeeded. William of Nassau was four times married. Maurice of Nassau, who distinguished himself as a general in the Thirty Years' war, was one of his sons, and William III. of

England a grandson of his. See Gachard's *Correspondance de Guillaume le Taciturne* (six vols., 1847-66); Juste's *Guillaume le Taciturne d'après sa Correspondance et ses Papiers d'État* (1878); Putnam's *William the Silent, Founder of the Dutch Republic* (1895); Harrison's *William the Silent* (1897); and especially the brilliant panegyric by J. L. Motley, *The Rise of the Dutch Republic* (1856).

WILLIAM I., emperor of Germany and 7th king of Prussia, was born in Berlin on March 22, 1797, and died on March 9, 1888. He was the second son of Frederick William III. and Louise of Mecklenburg-Strelitz. From his earliest years he was trained in military exercises, and in the campaign of 1813-14 he joined the Prussian forces as captain, receiving then, for bravery in the field, the 'Cross of St. George' from the Czar Alexander. When his father died in 1840 he became heir presumptive to the throne, and received the title of Prince of Prussia. On the outbreak of the Revolution in 1848 Prince William quitted Berlin for England, but was recalled in a few months. In the following year he proceeded against the insurgents with military vigour and suppressed the insurrections in Baden and the Palatinate. His brother having become incapable of ruling, William (1857) was appointed regent, and in Jan. 1861 he became king, being crowned at Königsberg in October of the same year. With the assistance of Otto von Bismarck as president of the cabinet, and Von Roon as war minister, he demanded from the nation a large scheme of army reform, and his foresight in this matter was justified by the Prussian successes in the war with Denmark (1864), and the complete overthrow of Austria at Sadowa (1866). The latter war had been brought about by the diplomacy of Bismarck, who now proceeded to form a North-German Confederation with King William as its head, and to conclude a treaty of alliance, offensive and defensive, with the South German States. This growing power of Prussia provoked the jealousy of France, and a crisis was reached in the negotiations concerning the Spanish crown. War was proclaimed between Prussia and France (1870), and the South-German States having declared in favour of the former, King William led the combined German forces through the campaign, which resulted in the defeat of Napoleon at Sedan, and finally in the siege and capitulation of Paris. Meanwhile the North German Parliament, uniting with the German princes, desired the king to become German emperor. This honour he accepted, and he was crowned as Emperor William I. at Versailles on 18th January, 1871. After the conclusion of peace with France, and having entered Paris with his army, the emperor returned to Berlin amid great enthusiasm. The latter part of his reign was passed in consolidating the power of the new German empire, and in parliamentary and political conflicts with the Catholic, Liberal, and Socialist parties in the state. (See GERMANY.) His life was attempted several times. Among biographies are those of Forbes (1888); G. B. Smith (1887); Strauss (1887); Simon (French, 1887; Eng. trans.); &c. See also Von Sybel's *Die Begründung des Deutschen Reichs* (1889-94; Eng. trans. five vols., 1890-92); Mallet's *Refoundings of the German Empire* (1892); Krause's *Growth of German Unity* (1892); and Oncken's *Das Zeitalter des Kaisers Wilhelm* (two vols., 1890-92).

WILLIAMS, ROGER, was born about 1604 or 1605, probably in London. He was educated at the Charterhouse and Pembroke College, Cambridge, took orders in the Church of England, and preached for some time as a minister of that church, but, embracing the doctrines of the Puritans, he embarked for

America, where he arrived in February, 1631. Here he soon incurred the displeasure of the authorities by his religious opinions. In July, 1635, he was summoned before the General Court to answer certain charges regarding his opinions on the power of the civil magistrate, &c. In Nov. 1635, an act was passed banishing him from the colony; and the court, learning that he still proclaimed his obnoxious opinions, and that he intended to establish a colony on Narragansett Bay, it was resolved to send him to England. He contrived, however, to escape, and with a few companions he founded a town, which he called Providence, in Rhode Island. In the course of a few years the little colony gained rapidly in numbers, and Williams established a government of pure democracy; and his system has had a marked influence on the political history of the state. In 1643 he went to England to obtain a charter for Rhode Island as a separate state. In 1651 he made a second voyage to England, and succeeded in averting the dismemberment of the young colony. He refused the office of governor which the colony wished to confer upon him, but continued to labour on for its good until his death in 1683. During his first visit to England he published his *Key into the Language of America* (London, 1643, 8vo); *The Bloody Tenent of Persecution for Cause of Conscience* (London, 1644, 4to), written in answer to Cotton's treatise, which upheld the right of the magistrate to regulate the doctrines of the church. This called forth a reply from Cotton, to which Williams rejoined in his *Bloody Tenent yet more bloody* (London, 1652, 4to). He also maintained a public dispute with the Quakers at Newport and Providence, and in answer to a work of Fox's published a strongly-worded treatise, *George Foxe digged out of his Burrowes* (Boston, 1676, 4to). His works have been reprinted chiefly by the Narragansett Club (1866-74). Roger Williams was a friend of Milton. See recent Lives by Merriman (1892) and Straus (1894).

**WILLIAMSPORT**, a town of the United States, in Lycoming county, Pennsylvania, on the left bank of the west branch of the Susquehanna. It is a favourite summer residence on account of its healthy situation and the beauty of the surrounding scenery. The hills in the vicinity contain iron, and the industries of mining and metallurgy are carried on. It is perhaps the greatest lumber market in the state. Pop. (1880), 18,934; (1900), 28,757.

**WILLIAMSTOWN**, a seaport in Victoria, on the south-west shore of Hobson's Bay, immediately opposite Port Melbourne, and  $9\frac{1}{2}$  miles s.w. of Melbourne. The business interests of the town largely centre in the shipping. The piers are commodious, and there are ship-building yards, patent slips, and a dry dock called the Alfred Graving Dock, opened in 1874 and improved in 1897-98. The chief buildings are the churches, the mechanics' institute, the custom-house, the sailors' rest, banks and similar buildings, &c. Basalt and brown coal are worked near the town, and several manufactures are carried on. Pop. (1891), 15,960; (1901), 14,083.

**WILLIS**, NATHANIEL PARKER, an American author, was born at Portland, Maine, 20th January, 1807. He was educated at Boston, Andover, and Yale College, where he graduated in 1827. During his college course he published some poems, for one of which he gained a prize offered by a publisher. He was employed by S. G. Goodrich (Peter Parley) to edit the *Legendary* in 1828, and the *Token* in 1829. In 1828 he established the *American Monthly Magazine*, which, after he had conducted it for two and a half years, was merged in the *New York Mirror*. He now set out on a tour of travel through Europe, visit-

ing France, Italy, Greece, European Turkey, Asia Minor, and finally England, with the rank of an attaché to the American embassy at Paris, but chiefly as a correspondent of the *Mirror*, for which he wrote his *Pencilings by the Way*. He married in England in 1835, returned to the United States in 1837, and after residing for some time on an estate on the Susquehanna, became in 1839 editor of the *Corair*, a New York periodical, but the same year he went to England. He returned to New York in 1844, and in conjunction with George P. Morris, his former publisher, established a daily paper called the *Evening Mirror*, but on the death of his wife shortly afterwards he returned to England. On his return to New York he married again (October, 1846), and associated with Mr. Morris in conducting the *Home Journal*, in which most of his subsequent productions appeared. He died 20th January, 1867. The following are among the leading works of Willis:—*Pencilings by the Way* (1835); *Inklings of Adventure* (1836); two dramas entitled *Two Ways of Dying for a Husband* (London, 1839); *Loiterings of Travel* (London, 1840); *Dashes at Life with a Free Pencil* (New York, 1845); *People I have Met, or Pictures of Society and People of Mark*, drawn under a Thin Veil of Fiction (1850); *Hurry-graphs* (New York, 1851); *a Health Trip to the Tropics* (New York, 1853); *Outdoors at Idlewild* (New York, 1854); *The Rag-bag*, a collection of ephemera (New York, 1855); *The Convalescent*, his *Rambles and Adventures* (New York, 1859).

**WILLOW** (*Salix*), a genus of trees and shrubs, belonging to the natural order Salicaceae, which belongs to the amentiferous or catkin-bearing plants. The characters of the order are: flowers naked, or with a membranous, cup-like calyx; ovules indefinite in number, erect, anatropal; fruit naked, coriaceous, unilocular, 2-valved; seeds comose; embryo erect; radicle inferior; leaves stipulate. The willows are natives of the temperate and cold regions, some of them being the most northern woody plants known. They are valuable trees, either for their timber or for other purposes. The willow, the sallow (both belonging to the genus *Salix*), and the poplar (*Populus*) are the representatives of the order, which consists of only two genera. The species of willow are very numerous, and many of them difficult to distinguish, varieties also being numerous. Most of them are confined to the more northern parts of the globe. The bark of some willows is employed for tanning, and sometimes, from its bitter and astringent properties, is given in intermittent fevers as a substitute for cinchona. Among the principal willows indigenous to Great Britain are the Goat Willow or Sallow (*S. caprea*), the White or Huntingdon Willow (*S. alba*), and Russell's or the Bedford Willow (*S. Russelliana*). The Goat Willow is among the broadest leaved of the willow tribe. The vigorous young shoots have a dark-brown glossy bark, which in spring-time forms a fine contrast with the buds, which are white, and render it one of the most ornamental of the genus. It attains a height of 40 or 50 feet, and its timber is reckoned the best among the willows. As a coppice plant it produces excellent hoops, poles, rods of crates, &c. The Huntingdon Willow frequently reaches a height of from 50 to 80 feet, with a trunk 2 or 3 feet in diameter. It is more frequently planted as a timber tree than any other willow. The Bedford Willow was brought into notice by the Duke of Bedford about the beginning of the nineteenth century. It is one of the best of the tree willows, and may reach a height of 90 feet. Willow timber is white, soft, and light, and the best kinds are very durable. It is consequently used for a variety of purposes, such as in agricultural



implements, for turnery, &c. Of the dwarf willows or osiers adapted for basket-making the variety is very great. The most approved kinds are the *S. viminalis*, *S. rubra*, and *S. Porphyra*, and the numerous varieties related to these species, among which the Pack-thread, Whip-cord, and Red Dutch are known in some districts. They are always propagated by cuttings, as indeed are most willows, the shoots taking root very readily. The Weeping Willow (*S. Babylonica*), so generally admired for its long, pendent branches, grows wild in Persia, and, besides, has long been a favourite ornamental tree in China. (See WEEPING TREES.) Almost all the willows are of the easiest propagation and culture.

**WILLOW-FLY**, a name given to various species of Neuroptera (which see) and to the family Perlidae or 'Stone-flies.' The willow-flies have a large folded front pair of wings and two bristle-like caudal or tail appendages.

**WILLOW-MOTH** (*Caradrina quadripunctata*), the parent of a caterpillar which feeds upon wheat in the field, as well as after it is housed or stacked, sometimes effecting incredible mischief. The moth (see Pl. II., ENTOMOLOGY, fig. 55), is rather more than half an inch in length, and is of a mouse colour. It rests with its wings closed flat upon its back. The caterpillar is fleshy, and varies in colour from a dull ochreous red to a dirty green. The chrysalis is bright brown and shining. The caterpillars are first observed when they are half-grown in October. They live through the winter feeding upon grain, and in February or March draw the corn together with a thin silken web, in which they change to the chrysalis form. The moths escape from the chrysalis state in May, June, and July, and are often abundant in hay-fields, rick-yards, banks, and gardens.

**WILMINGTON**, a city and port of the United States, in Delaware, 28 miles south-west of Philadelphia, on the river Delaware, at the junction of Brandywine and Christiana Creeks, both navigable. It is regularly built in broad and airy streets; and has about fifty churches, a university, various schools, a city-hall, an opera-house, an hospital, flour, saw, paper, and powder mills, cotton and woollen factories, iron-foundries, rolling-mills, machine-shops, potteries, tanneries, and breweries, and an extensive trade. Pop. (1890), 61,481; (1900), 76,508.

**WILMINGTON**, a town and port of the United States, in North Carolina, on the left bank of the Cape Fear River, 160 miles north-east of Charleston. It is the largest and most commercial place in the state; has numerous turpentine distilleries, machine-shops, rice, saw, and other mills; and exports large quantities of cotton, spirits of turpentine, resin, and lumber. It is a leading market for naval stores. Pop. (1890), 20,056; (1900), 20,976.

**WILNA.** See VILNA.

**WILSON, ALEXANDER**, the American ornithologist, was born at Paisley, 6th July, 1766. In his thirteenth year young Wilson was bound apprentice to a weaver. After serving an apprenticeship of three years, and working as a journeyman weaver for about four years (spending much of his spare time in reading and in making verses), he abandoned the loom, and adopted the life of a pedlar. Three years were spent in this mode of life; and in 1789, having already prepared a volume of poems for publication, he offered his muslins and solicited subscriptions for his work. It was published in 1790, but had little success; and he again returned to the loom. Soon after he recited before an Edinburgh debating society a poem called *The Laurel Disputed*, on the comparative merits of Allan Ramsay and Robert Ferguson; and the merits of this performance gained him the friendship of several gentlemen, among others Dr. Anderson,

editor of the *Bee*, to which periodical Wilson became a contributor. In 1792 he published his *Watty and Meg*, which, having appeared anonymously, was ascribed to Burns, though the style is very different. It is said to have had a sale of 100,000 copies in a few weeks. Having written a severe satire upon a person in Paisley Wilson was thrown into prison, and was afterwards compelled to burn the libel with his own hand at Paisley Cross. He was likewise looked upon with suspicion as a member of the Society of the Friends of the People, who hailed the French revolution as a new morning of liberty; and, impelled by these circumstances, he determined to emigrate to the United States. He arrived at New-castle, in the state of Delaware, in 1794, and again resumed his former trade, but after a while turned schoolmaster, acting in this capacity in several places in Pennsylvania. It was while thus engaged at Kingessing, near Philadelphia, that he became acquainted with William Bartram, the naturalist, and Alexander Lawson, an engraver, whose taste and instructions proved the occasion of calling out his own talents. He had already undertaken some long excursions for making ornithological researches, and devoted much time to the study, when he was engaged, in 1806, to assist in editing the American edition of Rees's Cyclopaedia, and now began to prepare for the publication of his work on American ornithology. The first volume of this work was published in 1808, and the seventh in 1813. The interval had been passed in exploring different parts of the country for the purpose of extending his observations, collecting specimens, and watching the habits of birds in their native haunts. In 1813 the literary materials for the eighth volume of the Ornithology were ready; but its progress was greatly retarded for want of proper assistants to colour the plates. Wilson was therefore obliged to undertake the whole of this department himself, in addition to his other duties; and these multifarious labours, by drawing largely upon his hours of rest, began rapidly to exhaust his constitution. A fatal dysentery at last seized him, which, after a few days' illness, carried him off on the 23d August, 1813. All the plates for the remainder of the Ornithology having been completed under Wilson's own eye the letterpress of the ninth volume was supplied by his friend George Ord, who had been his companion in several of his expeditions, and who also wrote a memoir of the deceased naturalist to accompany the last volume. He also edited the eighth volume. Four supplementary volumes, containing American birds not described by Wilson, were published by Charles Lucien Bonaparte (1825-33). An edition of the original work, with Bonaparte's continuation, and with notes and a life of Wilson by Sir William Jardine, was published in London in 1832 (three vols. 8vo); and various other editions, with additional notes and illustrations, have since appeared in Great Britain and in America. Wilson continued to write poetry after his arrival in America, one of his chief productions being *The Foresters*, a poem describing a pedestrian tour to the Falls of Niagara. Several collective editions of his poems have been published. A bronze statue of Wilson has been erected at Paisley.

**WILSON, HORACE HATMAN**, a distinguished orientalist, born in London in 1786; died there May 8, 1860. He was educated for the medical profession, and in 1808 went out to Bengal as assistant-surgeon in the service of the East India Company, but immediately after his arrival was appointed on account of his knowledge of chemistry to an office in the Calcutta mint, of which he afterwards became assay-master and secretary. All the leisure that this employment allowed him was devoted to the study of Sanskrit, and so



rapidly did he become known as an able scholar in this department that in 1812 he was elected secretary of the Asiatic Society of Bengal. He was also an active friend of education, served on the commission to remodel the Sanskrit College at Benares, and acted for many years as secretary of the committee of public education. His exertions greatly contributed to revive the interest of the Hindus in their own literature as well as to create among them an interest in the science and literature of Europe. He remained in India till his election in 1832 to the Boden professorship of Sanskrit at Oxford University. Soon after his return to this country he was also appointed librarian at the India House and director of the Royal Asiatic Society, and elected a fellow of the Royal Society. His publications are extremely numerous. Among them are: *The Megha Duta*, or *Cloud Messenger*—a Sanskrit poem, with an English translation, notes, &c. (Calcutta, 1813); a Sanskrit-English Dictionary (Calcutta, 1819; second edition, 1832; third edition, 1874); *Hindoo Theatre*—select specimens translated from the original Sanskrit (Calcutta, 1827); *The Vishnu Purana*—a System of Hindu Mythology and Tradition, translated from the original Sanskrit and illustrated by notes (1840); *Grammar of the Sanskrit Language for the Use of Early Students* (1841); a new and enlarged edition of Mill's *History of British India* (1840-48); *Rig-Veda Sanhita*—translated from the original Sanskrit (six volumes, 1850-88), the last volumes being prepared by Prof. E. B. Cowell and W. F. Webster after Wilson's death.

WILSON, JOHN, a celebrated author, was the son of a wealthy manufacturer in Paisley, and born there on 18th May, 1785. He received his early education in the manse of Mearns, Renfrewshire, with the minister of which parish he was boarded for some years. At the age of fourteen he was sent to Glasgow University, and from thence in 1803 to Magdalen College, Oxford, where he gained the Newdgate prize of £50 for an English poem, taking the B.A. degree in 1807, and the M.A. in 1810. While at Oxford he was noted for his skill in boating, cricketing, and other athletic sports, and also for various frolics of a more questionable nature, such as becoming waiter at an inn, and roving about the country with a gang of gypsies. Having at twenty-one come into a large fortune left him by his father, he purchased the property of Elleray, on Windermere, and retired there to live at his ease, writing poetry and engaging in field sports and occasional wild frolics, to which the exuberance of his animal spirits was ever impelling him. In 1811 he married, and in 1815 was admitted a member of the faculty of Advocates at Edinburgh, but beyond this he made almost no progress in the legal profession. In 1812 he contributed to the *Annual Register* a set of stanzas entitled the *Magic Mirror*. During the same year he published anonymously an elegy on the death of Grahame, the author of *The Sabbath*, and also, along with some other poems, the once-famed *Iale of Palms*. Another poem, in the dramatic form, *The City of the Plague* (1816), was still more successful; but it also has now been forgotten. Wilson's fame with posterity was destined to rest on his prose writings, and more especially his contributions to *Blackwood's Magazine*. Under the management of the publisher himself, with the coadjutorship of Wilson, Lockhart, Hogg, and others, this magazine became the leading Tory periodical of the day, and was as much noted for the interest and ability of its articles in general, as for the acrimony and occasional scurrility with which it treated its political or other antagonists. Among the numerous papers furnished by Wilson may be mentioned those

celebrated ones on fishing, shooting, and kindred pursuits, produced under the well-known sobriquet of Christopher North, and above all his renowned *Noctes Ambrosianae*, a series of conversations on literary and general subjects, supposed to take place at certain convivial meetings held in Ambrose's Tavern by the contributors to the *Magazine*. They have since been reprinted in a separate form. In 1820—much to many people's surprise—he obtained the chair of moral philosophy in the University of Edinburgh, a post he occupied with credit for thirty-two years. In 1822 to 1824 he published three prose works of fiction—*Lights and Shadows of Scottish Life*, *The Foresters*, and *The Trials of Margaret Lyndsay*, which are marked by pathos and beauty of description, but are far from being faithful transcripts of human nature, and degenerate at times into a mawkish sentimentality. After 1837 he ceased to be one of the regular contributors of *Blackwood's Magazine*. A government pension of £300 per annum was bestowed on him in 1851, and the following year he resigned his professorship. An attack of paralysis and a dropsical affection laid him totally prostrate in the commencement of 1854, and on 3rd April of that year he died at his house in Gloucester Place, Edinburgh. There is an incomplete edition of his works by Professor Ferrier, his son-in-law (twelve vols., 1855-58), and a separate edition of the *Noctes* by R. S. Mackenzie (five vols., 1866). His daughter, Mrs. Gordon, wrote a *Memoir* of him.

WILSON, RICHARD, an English landscape-painter, was born at Penegoes, in Montgomeryshire, in 1714. After receiving a classical education he was sent to London, and placed as a pupil with an obscure portrait-painter. On leaving his master he first practised in the same branch of his profession in London, but with no great success. At length he went to Italy, where he occasionally exercised his talents in studies of landscape; and at Venice, meeting with Zuccarelli, that artist persuaded him to devote himself wholly to the cultivation of that department of the art in which he attained so much excellence. After staying some time at Rome and Naples, where he acquired great reputation, he returned to England in 1756, and settled in the metropolis. He had for a while much employment; but he was at length doomed to undergo indifference and neglect, and was glad to obtain the office of librarian to the Royal Academy, of which he was one of the brightest ornaments. He died in May, 1782. His taste was exquisite, and whatever came from his easel bore the stamp of elegance and truth. Among his best works are the *Niobe*, the *Ruins of the Villa of Mæcenæ*, *Phaethon*, *Snowdon*, the *View of Rome from the Villa Madama*, &c., several of which have become familiar to the general public through engravings.

WILTON, a municipal and former parl. borough of England, in the county of Wilts, 3 miles west by north of Salisbury, in a fertile valley, near the confluence of the Nadder and Wily; with a handsome Romanesque church, several Dissenting chapels, a free school, a literary institute, and a hospital. Its carpets have long been celebrated. It returned a member to Parliament till 1885. It is a very ancient town; it was the capital of the Anglo-Saxon Kingdom of Wessex, and gave the name to the county of Wilts. Pop. (1891), 2120; (1901), 2208.

WILTS, or WILTSHIRE, a south-western county of England, bounded on the north and north-west by the county of Gloucester, on the west by Somerset, on the south by Dorset and Hants, on the east by Hants and Berks; area, 866,443 acres, of which fully 50,000 are under woods and plantations, about 145,000 under corn crops, namely, wheat, oats, and barley, about 80,000 under green crops, chiefly tur-

nips, vetches, and cabbage, and some 420,000 in permanent pasture. It is of a compact and nearly quadrangular form, and is divided by the Bristol Avon and Kennet, and the canal between them, into north and south divisions distinguished from each other to a considerable extent by distinct physical features; the north consisting principally of a fertile flat, with scarcely any perceptible slope, except on the north frontiers, where it begins to rise in the direction of the Cotswold Hills, and near the centre, where it is broken by a ridge of downs; and the south, though presenting at a distance the appearance of an almost uninterrupted plain, having in fact an undulating surface, both broken by downs and intersected by some fertile and well-watered valleys. In this south division is Salisbury Plain, an elevated plateau, for the most part uncultivated and uncultivated, covered with a scanty herbage, well adapted for sheep-walks, and presenting, as its most remarkable feature, the megalithic remains of Stonehenge, situated about 9 miles north of Salisbury, and those of Avebury, about 5 miles west of Marlborough. The strata of the county are principally Cretaceous and Jurassic. The drainage belongs to three distinct basins—the Thames, which receives a small portion directly, and a still larger portion by the Kennet; Bristol Channel, which receives it by the Bristol Avon; and the English Channel, which receives it by the Salisbury Avon, and its tributaries Bourne, Wily, and Nadder. Though the arable land is of considerable extent, the larger proportion of the surface is kept in pasture, devoted chiefly in the south division to the rearing of sheep, and in the north to cattle-grazing and the dairy. The Wiltshire bacon and cheese are famous. The manufactures comprise woollen goods, for which the principal localities are Wilton, famous particularly for carpets, Bradford, Trowbridge, Westbury, &c.; excellent cutlery and steel goods at Salisbury, ropes and sacking at Marlborough, iron-founding at Devizes. Wiltshire forms five parliamentary divisions (northern, north-western, western, eastern, and southern), each returning one member; of the towns, Salisbury (the county town), with one member, is now (since 1885) the only parliamentary borough. Salisbury, Swindon, Calne, Marlborough, Devizes, Chippenham, and Wilton are municipal boroughs. Pop. (1891), 264,997; (1901), 273,845.

**WIMBLEDON**, a town of England, in the county of Surrey, on the south-west of London, of which it is practically a suburb, at the north-east extremity of the common of same name, which until 1889 was well known in connection with the shooting competitions of the National Rifle Association. It has a free library, alms-houses, three hospitals, and many fine residences, being a favourite residential locality. The common has an area of about 1000 acres. The Wimbledon or north-eastern division is one of the six parliamentary divisions of Surrey. Pop. (1891), 25,758; (1901), 41,604.

**WINCHESTER**, an ancient city of England, capital of Hampshire, and a parliamentary and municipal borough, situated on the right bank of the Itchen, 10 or 11 miles from Southampton. The most important public edifice is the cathedral, which occupies a large open space on the south-east. The oldest parts of the present structure date from the eleventh century, but the greater part of the main building was erected at various times from the thirteenth to the sixteenth century, William of Wykeham (1324–1404) having an important share in the work. It is in the form of a cross, with a massive and somewhat heavy central tower (without a spire) and no other towers; length from east to west, 545 feet, width of the transepts 186 feet. The

west front has a panelled gable, with an ornamented gallery, a large and beautiful window with rich mouldings, massive buttresses and pinnacles, and a gable termination crowned by a canopied statue of William of Wykeham. The length of the nave, which has a very beautiful interior, is 351 feet, height 86 feet; the transept contains several beautiful chapels and altars. The workmanship of the choir is remarkably rich, the great screen has been restored in a magnificent manner, and there is a splendid modern reredos. There are numerous monuments of interest: as the tombs of William Rufus, of Edmund, son of King Alfred, of William of Wykeham, Cardinal Beaufort, and of Isaac Walton; the shrine of St. Swithin; &c. The other edifices and establishments worthy of notice are St. Mary's College (Winchester College or School, one of the great English public schools), founded by William of Wykeham in 1387, richly endowed and accommodated in a large range of buildings, of which the chapel, hall, and library are beautiful specimens of architecture; the guildhall; the old castle, which has been restored and assize courts built adjoining; a corn-exchange; barracks for 2000 infantry; the hospital of St. Cross, founded in 1132, several other charitable institutions, a free library and museum, school of art, &c. The Abbey Gardens are very beautiful, and statues of Alfred the Great by Hamo Thornycroft, and Queen Victoria by Alfred Gilbert, adorn the town. There are no manufactures or trade of any consequence. Winchester was called *Caer-Gwent* by the Britons, *Venta Belgarum* by the Romans—under whom it was an important place, with a Christian church—and *Wintanceaster* by the Saxons. It became the capital of England under the Saxons, when the country was united under the sway of Egbert, in the first half of the ninth century, and it retained this dignity till the middle of the eleventh century, being a royal residence and place where parliaments met after this also. After the battle of Naseby it stood a week's siege by Cromwell. It returns one member to Parliament. Pop. (1891), 19,073; (1901), 20,919.

**WINCKELMANN**, JOHANN JOACHIM, the eminent critic and historian of ancient classical art, was born of poor parents at Stendal, Prussia, the 9th December, 1717. His early-awakened love of study attracted the attention of the rector of the school of his native place, who took him into his house as companion and assistant. After having gained a sound knowledge of Latin and Greek he went to a gymnasium at Berlin in 1735, then in 1738 went to study theology at Halle. Impelled by a passion for the study of classical literature, he ceased attending the theological lectures at the end of two sessions, and spent several years as a private tutor and as a schoolmaster. In 1748 he was appointed by Count Heinrich von Büнау secretary in his library at Nöthnitz, near Dresden. In 1755, after years of mental struggle, he went over to the Roman Catholic Church, on the promise of a pension being made him by the papal nuncio at Dresden to enable him to visit Rome. Here he was appointed librarian to Cardinal Albani, an art connoisseur and collector, and gave the public his ideas on ancient art. The more important of his works are *Geschichte der Kunst des Alterthums* (Dresden, 1764); *Monumenti Antichi Inediti* (two vols., Rome, 1767–68); with various sets of letters on the remains at Herculaneum and Pompeii. He now began to be recognized as the leading authority in Europe on the branches of study to which he had devoted himself. In 1768 he resolved to revisit Germany, intending to stay some time at Berlin. He reached Munich, where a longing for his beloved Italy so overmastered him

that he at once determined to return. He went by Vienna, where he was well received, and where he was presented to the Empress Maria Theresa, who bestowed rich presents on him. In the beginning of June he departed for Trieste, where, for the sake of the gold medals and valuables in his possession, he was murdered by a fellow-traveller, a scoundrel named Arcangeli. The robber was interrupted, and fled without securing any booty, and was subsequently taken and executed. A collective edition of Winckelmann's works was published in Dresden in 1808-20, in eight vols.

**WIND**, the motion of air as a current in any direction. The general fact that determines the occurrence of winds is the law of gravitation. In accordance with this law heavier air must always seek to pass under lighter air, and if the heavier and lighter air are at different parts of the surface of the earth, a horizontal motion must be produced through the former flowing towards the place of the latter in order to restore equilibrium. The general cause of differences in the gravity of the air at different parts of the earth's surface is difference of temperature, ultimately due to the heat of the sun. Heat expands and rarefies air, while cold condenses it, and consequently the general direction of air-currents on the surface of the earth is from cold parts to warm parts. The best illustration of this fact is to be found in a phenomenon with which nearly every one is familiar, that of *sea and land breezes*. At all places near the coast such breezes blow alternately by day and night, when their influence is not overpowered by winds due to other causes. During the day the sun raises the temperature of the land higher than that of the sea, in consequence of which the air above the land becomes rarer than that above the sea, and a sea-breeze blows over the land. During the night, on the other hand, the land gives off its heat by radiation more rapidly than the sea, and the air above the land becomes on that account colder than that above the sea, and a land-breeze accordingly then blows seawards. What takes place on a small scale on every coast goes on at all times over the whole earth between the poles and the tropics, producing winds that blow with remarkable steadiness over large tracts of the ocean. The same steadiness is not observed on the land, for there the irregularity of the surface, combined with other causes, is constantly affecting the course of the air-currents. In all the three great oceans, however, there are certain winds, called *trade-winds*, which always blow in the same direction, though with seasonal variations in the area over which they blow. These are cold currents of air constantly flowing in from the polar regions to replace the warmer and lighter air which is constantly ascending from the tropical belt, and which finds its way back, at first entirely through the upper strata of the atmosphere, to the regions in which the cold currents take their rise. The direction of these winds, which is nearly due west, but slightly south or north, according as it is a north-east or south-east trade-wind, results from the axial rotation of the earth from west to east. The cold currents that form the trade-winds, coming from the polar regions where the daily motion of the earth is comparatively small and therefore slow, do not at once acquire the rate of motion of those parts of the surface to which they advance, and consequently lag behind, forming currents blowing in an opposite direction to that in which the earth rotates. The difference in the rate of rotation, however, becomes sensible only when the cold currents have advanced sufficiently far in the direction of the equator to make the difference considerable. The fact of these winds blowing so nearly due west shows that the rate of motion arising from

the difference in rate of rotation just explained is much greater than that of the inflow of cold air from the north and south. Hence it arises that these winds are not nearly so cold as if they were blowing directly in from the polar regions at a rate at all approaching that of the winds themselves. In slowly passing through the lower degrees of latitude the cold currents have time to get warmed before they reach the regions of the trade-winds. For particulars regarding the limits of the trade-winds see the articles on the ATLANTIC, PACIFIC, and INDIAN OCEANS.

From the account just given of the trade-winds it will be seen that the general character of the air-movement is twofold. There is a movement from the poles towards the equator, and a return movement from the equator to the poles. In low latitudes the latter takes place exclusively in the higher strata of the atmosphere, but in higher latitudes its effect is often felt on the surface of the earth. In these latitudes, then, the winds may be divided into equatorial and polar, the former being as a rule more or less westerly, the latter more or less easterly. The equatorial winds are distinguished in general by the highest temperature, the greatest degree of saturation, the most cloudy weather, the most frequent rainfall, and the lowest atmospheric pressure; and the polar by the lowest temperature, the least degree of saturation, the clearest weather, the least rainfall, and the highest atmospheric pressure. This explains why in our country the south-west wind is that which brings the most rain, and why a falling barometer is as a rule a sign of approaching rain, and also why the barometer, as is well known, usually shows an upward tendency with an east wind. See also METEOROLOGY.

Certain winds have a seasonal character, being either confined to certain seasons of the year, as the *harmattan* of the Guinea coast and the *etiesian* winds that blow from the north in summer in the eastern part of the Mediterranean, or changing their direction at certain seasons, such as the *monsoons* of the Indian Ocean. (See MONSOON and HARMATTAN.) These winds are due to local difference of temperature produced by the passage of the sun from one hemisphere to another in the course of the year. Another class of winds consists of those which blow either towards or away from a common centre, the former being called *cyclones* and the latter *anti-cyclones*. (See CYCLONE.) *Tornado*, *typhoon*, *hurricane*, &c., are merely local names for cyclones, and the *simoom* (which see) of Sahara has also a cyclonic character. To the last-mentioned wind the *khamseen* of Egypt (hot sand-storms from the south) are said to owe their origin, as also the oppressive winds that blow at certain seasons from a more or less southerly direction over the countries bordering the Mediterranean on the north, and which are called by different names in different countries, in Spain the *solano*, in Italy the *strocco*, in Turkey the *samiel*.

**WINDERMERE**, or **WINANDERMERE**, the largest sheet of water in England, and hence, as well as on account of the beauty of its scenery, styled the Queen of the Lakes, forms part of the county of Westmoreland, though the greater part of its margin belongs to Lancashire. It is about 11 miles long, and on an average about 1 broad. Its principal feeders are the Brathay and the Rothay, which unite shortly before entering the lake. Numerous islets diversify its surface at no great distance from each other. Its depth reaches in some parts 240 feet.

**WINDHAM**, WILLIAM, an orator and statesman, born in London May 8, 1750; died there June 4, 1810. He was the last descendant of an old English family that had possessed the seat of Felbrigg Hall, in the county of Norfolk, since 1461. After

being educated at Eton, Glasgow, and Oxford, and making the tour of the continent of Europe, he was returned to parliament as member for Norwich. During the early part of Pitt's administration he sat in the opposition, but during the course of the French revolution, when the violence of the revolutionists grew beyond bounds, he joined Burke in condemning the revolutionary principles, and advocating the war that Pitt declared against France. In 1794 he was appointed secretary-at-war, with a seat in the cabinet, which he retained till the retirement of Pitt from office in 1801. Under the Fox and Grenville ministry, which came into office in January, 1806, he held the rank of colonial secretary. During his tenure of office he brought in and succeeded in passing against strenuous opposition a measure for reducing the duration of the period of enlistment for soldiers, and making various provisions for improving the condition of the soldier. In March, 1807, Windham was again out of office, the Grenville ministry being then succeeded by that of Perceval, several of the proceedings of which, but especially the expedition against Copenhagen and the Walcheren expedition, he vigorously opposed. Windham was a man of thoroughly independent character, accustomed to think and act for himself, and indulging a wide variety of tastes with a zeal that indicated the thoroughness of the enjoyment he derived from them. Although of an active disposition, and an ardent lover of all manly sports, in the number of which he counted bull-baiting and prize-fighting, he was a refined scholar, and had the reflective habits of a psychologist. His faults were the faults of his qualities. His independence sometimes passed over into eccentricity, and his reflectiveness occasionally degenerated into something that had the appearance of hypochondria. A collection of Windham's speeches with a life was published in 1806; his diary in 1866. A part of his diary, relating to the death of Dr. Johnson, with whom he was intimate, had previously appeared in Croker's edition of Boswell's Life of Johnson.

**WIND-INSTRUMENTS**, musical instruments played by the human breath, as the flute, the cornet, &c., or by artificially produced currents of air, as the organ, harmonium, &c., in all of which the vibrations of a column of air produce the sound. The wind-instruments of an ordinary orchestra are usually divided into two classes: wood instruments (called shortly *woods*) and brass instruments (*brasses*); the organ or harmonium being classed apart. The woods, some of which are partially composed of ivory, are the piccolo, flute, flageolet, clarinet, basset-horn, oboe, and bassoon. Their tone is light, smooth, and soft, and almost vocal in its character, and can be produced in all the delicate crescendo and diminuendo shadings. The brasses comprise the cornet-a-piston, horn, trumpet, trombone, euphonium, bombardon, &c. Their tone is somewhat harder, and generally more powerful and majestic, than that of the woods. Being fixed-toned instruments (except the trombone) they cannot, like the strings, play in perfect tune, and they can only produce one sound at a time. For the number of the wind-instruments and their proportion to stringed and percussion instruments in an orchestra, see our article **ORCHESTRA**.

**WINDLASS**, in mechanics, a machine for raising weights, such as coals from a pit, consisting of a cylinder or roller moving on an axle supported on a frame, and turned by levers inserted in square holes cut in the cylinder, or by a crank fitted on to one or both ends of the axle. One end of a rope or chain is attached to the cylinder, and the other to the weight, which is raised by the rope being shortened in passing round the roller. See **WHEEL AND AXLE**.

**WIND-MILL**, a mill which receives its motion by the wind acting upon sails. They are said to have been introduced into Europe by the knights of St. John, who had seen them in use among the Saracens. When wind is employed as the first mover of machinery it may be applied in two ways—1, by receiving it upon sails which are nearly vertical, and which give motion to an axis nearly horizontal, in which case the machine is called a *vertical wind-mill*; and, 2, by receiving it upon vertical sails which move in a horizontal plane, and give motion to a vertical axis, in which case it is called a *horizontal wind-mill*. As a horizontal wind-mill consists of vertical sails moving horizontally around a vertical arbour or windshaft, no motion would arise on exposing it to the action of the wind, as the effect of the wind upon the sails on one side would be counterbalanced by its action upon the corresponding sails on the opposite side. Hence it is necessary either to screen the sails on one side from the action of the wind, or to construct the sails in such a manner, that when they return against the wind, they present only their edge to its action. When the screen is not used, the sails may be fixed like float-boards with hinges on the circumference of a large drum or cylinder, so that, when they are to receive the action of the wind, they stand at right angles to the drum, and when they return against the wind they fold down upon its circumference. In the vertical wind-mill the arms which carry the sails revolve in a plane facing the wind. In this arrangement, if the sails were in the same plane with the arms the wind would fall perpendicularly upon them, and merely press the arms against the building, perpendicular to the plane in which they are designed to move. If, on the other hand, the sails were perpendicular to the plane in which the arms move, their edges would be presented to the wind, and would therefore offer no resistance, and there would be no motion. In order to make the arms revolve, the sails must therefore be placed in some direction intermediate between those of the wind and the plane in which the arms revolve. In determining the angle at which the planes of the sails should be inclined to the axis of motion, or the direction of the wind, it is necessary to consider the sail in motion; and the neglect of this element in the calculation has led to very great errors in theoretical calculations. The sail being in motion, the velocities of the sail and the wind must both be taken into account; for, if the sail moved before the wind with a speed equal to that of the wind itself, no effect would be produced. The effect will depend on the difference of the velocities, that being the velocity with which the wind strikes the sail. Now, as the obliquity of the sail to the wind should depend on the force with which the wind acts upon it, and as those parts of the sail which are nearer to the centre of motion move more slowly than those which are more remote, it follows that the position of the sail should vary at different distances from the centre of rotation. From the experiments of Smeaton on this subject it appears that the following positions are the best. Suppose the radius to be divided into six equal parts, and call the first part, beginning from the centre, one, the second two, and so on, the extreme part being six.—

No.	Angle with the Axis.	Angle with the Plane of Motion, or Angle of Weather.
1.	72°	18°
2.	71	19
3.	72	18
4.	74	16
5.	77½	12½
6.	88	7

As it is necessary that a wind-mill should face the wind from whatever point it blows, the whole

machine, or a part of it, must be capable of turning horizontally. Sometimes the whole mill is made to turn upon a strong vertical post, and is therefore called a *post-mill*; but more commonly the roof or head only revolves, carrying with it the wind-wheel and its shaft, the weight being supported on friction rollers. In order that the wind itself may regulate the position of the mill, a large vane, or weather-cock, is placed on the side which is opposite the sails, thus turning them always to the wind. But in large mills the motion is regulated by a small supplementary wind-wheel, or pair of sails, occupying the place of the vane, and situated at right angles with the principal wind-wheel. When the wind-mill is in its proper position, with its shaft parallel to the wind, the supplementary sails do not turn. But when the wind changes they are immediately brought into action, and, by turning a series of wheelwork, they gradually bring round the head to its proper position.

On account of the inconstant nature of the motion of the wind, it is necessary to have some provision for accommodating the resistance of the sails to the degree of violence with which the wind blows. This is commonly done by clothing and unclotting the sails; that is, by covering with canvas or thin boards a greater or smaller portion of the frame of the sails according to the force of the wind at different times. A method has been devised for producing the same effect by altering the obliquity of the sails; and wind-mills have been so made as to regulate their own adjustment by the force of the wind. If we suppose a wind-mill, or wind-wheel, to consist of four arms, and that the sails were connected to these arms at one edge by means of springs, the yielding of these springs would allow the sails to turn back when the wind should blow with violence; and their elasticity would bring them up to the wind whenever its force abated. This effect has been produced by a weight acting on the sails through a series of levers.

**WINDOW**, an opening in the wall of a building to admit light and air into the interior. In dwelling-houses in ancient times the windows were narrow slits, as they were also in the castles and mansions of the middle ages. When glass was first used in windows is uncertain. It was not until the end of the twelfth century that it was used to any extent in the windows of private houses of England, and the glass had to be imported. Windows were almost unknown in the religious edifices of the Egyptians, Greeks, and Romans, the light being admitted at the roof, but they constitute an essential and distinguishing feature of the Gothic style. In Britain a window-tax was first imposed in 1695, was several times increased, and in 1850 produced £1,832,684; the tax was repealed in 1851, and a tax on house property substituted. See also **ARCHITECTURE**.

**WINDPIPE**. See **TRACHEA**.

**WINDSOR**, or **NEW WINDSOR**, a municipal borough and market-town, in the county of Berks, 22 miles w. from London. It lies on the right bank of the Thames, connected by a bridge with Eton, with which town and Clewer it forms a parliamentary borough returning one member. There are several churches and chapels, a town-hall, a corn-exchange, the Albert Institute, a theatre, barracks for cavalry and infantry, an infirmary, &c. The population of the municipal borough in 1891 was 12,327; in 1901, 18,958; the corresponding populations for the parliamentary borough being 18,893 and 21,477. Windsor Castle, for many centuries the chief residence of the English sovereigns, stands on the east side and almost in the town, and is built on a lofty mass of chalk which overhangs the bend of the river. The earliest part of the present structure is to be found on the south side of the upper ward, from the

Victoria Tower, where are His Majesty's private rooms, to Edward the Third's and the Devil Tower. This is of the time of Henry II., from which date many alterations have been made by successive sovereigns. The original Norman castle included the upper and middle wards with the Round Tower. The lower ward was added by Henry III. It extends the tower which bears his name and the Winchester Tower to the west, and includes St. George's Chapel, the Cloisters, the lodgings of the Military Knights, Henry VIII.'s gate, and the Curfew or Clewer and other towers. Edward III. greatly enlarged the building. He founded there the Order of the Garter. St. George's Chapel was begun by Edward IV. and finished by Henry VIII., at which time also was built the Tomb House, formerly containing the unfinished tomb of its royal founder; under this building is the Royal Vault constructed by George III. The building itself was decorated at the instance of Queen Victoria, and is now called the Albert Chapel. In the vaults of St. George's Chapel lie Henry VI., Edward IV., Henry VIII., and Charles I., beside many others. In the castle many illustrious captives have been confined, among others being John, king of France, James I. of Scotland, and Charles, duke of Orleans. On the north, east, and south the castle is surrounded by the Little or Home Park; over this and the surrounding country there are beautiful views from the great terrace of Queen Elizabeth, which runs along the north side of the upper ward. To the south lies the Great Park. An avenue of elms 3 miles long, known as the Long Walk, runs from the castle through this to Snow Hill, which is crowned with a colossal equestrian statue in bronze of George III. Three miles farther is the artificial lake Virginia Water; near this is Cumberland Lodge, and nearer to the castle is Frogmore, with the mausoleum in which Prince Albert and Queen Victoria are buried. In both parks there are many ancient and celebrated trees.

**WINDWARD ISLANDS**, one of the divisions of the Lesser Antilles in the West Indies, so called in opposition to another division of the same, called the *Leeward Islands*. The Windward Islands are Martinique, St. Lucia, St. Vincent, Grenada, Barbadoes, and Tobago. The name is, however, differently applied by different writers.

**WINE**, the fermented juice of the grape, the sugar which it contains being partially transformed by fermentation into alcohol and carbonic acid. The Egyptians attributed the invention of wine-making to Osiris, the Greeks to Dionysus, and the Latins to Saturn. Wine was in common use from an early period among the Hebrews; but the use of it was for a long time forbidden in Rome, and even at a later period was not allowed to women. The Greeks and Romans poured out libations to the gods upon the ground or table; and the custom of drinking to the health of distinguished persons or absent friends also prevailed in both nations.

The main processes which have to be gone through in wine-making are the gathering of the grapes (the vintage), the expression of the juice, which is sometimes preceded by the separation of the berries from the stalks, the fermentation of the juice or must, and lastly the racking off, the barrelling, &c. The vintage takes place at different times, according to the season and locality, in France generally from the beginning of September to the middle of October. The grapes must not be gathered till they are quite ripe. In France the bunches are generally cut from the vines with scissors, which are preferred to pruning or other knives. Before the juice is pressed out the stalks may either be removed or not. They yield an astringent principle to the wine, consisting



chiefly of tannin, which is of advantage to some wines, though others are sufficiently astringent of themselves. Wines are commonly divided into the two great classes of white wines and red. The former may be made from either white or coloured grapes, as the juice of all grapes is colourless, the colouring matter existing in the skins. The colouring matter is dissolved by the aid of the alcohol developed during fermentation, consequently in making white wines the skins must be separated from the juice before fermentation sets in. The juice is pressed out either by treading the grapes with the naked feet, or by the wine-press, which is always used when all the juice the grapes contain is wanted. The finest wines are those made with must expressed by simple treading. The wine-press differs in construction in different countries.

The juice of the grape, when newly expressed, and before it has begun to ferment, is called *must*, and in common language *sweet wine*. It is turbid, has an agreeable and very saccharine taste, and is very laxative. When the must is pressed from the grapes, and put into a proper vessel and place, with a temperature of between 55° and 60°, a gradual fermentation ensues. Bubbles of carbonic acid rise to the surface, bringing along with them the skins, stones, and other grosser matters of the grapes, and which form a scum, or soft spongy crust, that covers the whole liquor. After a time the crust becomes stiff, is broken in pieces by the ascending gas, and falls to the bottom of the liquor. When this takes place, if we would secure a good and generous wine, all sensible fermentation must be checked. This is done by putting the wine into close vessels, and carrying these into a cellar or other cool place. The wine produced by this first fermentation differs entirely and essentially from the juice of grapes before fermentation. Its sweet and saccharine taste is changed into one that is very different, though still agreeable and somewhat spirituous. It has not the laxative quality of must, and if taken immoderately occasions drunkenness; when distilled it yields, instead of the insipid water obtained from must, genuine alcohol. When any liquor undergoes the spirituous fermentation, all its parts seem not to ferment at the same time, otherwise the fermentation would probably be very quickly completed, and the appearances would be much more striking; hence, in a liquor much disposed to fermentation, this motion is more quick and simultaneous than in another liquor less disposed. Experience has shown that a wine, the fermentation of which is very slow, is never good, and, therefore, when the weather is too cold, the fermentation is accelerated by heating the place in which the wine is made. A too hasty and violent fermentation is also hurtful, from the dissipation and loss of some of the spirit. However, we may distinguish, in the ordinary method of making wines of grapes, two periods in the fermentation, the first of which lasts during the appearance of the sensible effects above alluded to, in which the greatest number of fermentable particles ferment. After this first effort of fermentation these effects sensibly diminish, and ought to be stopped for reasons hereafter to be mentioned. The fermentative motion of the liquor then ceases. The heterogeneous parts that were suspended in the wines by this motion, and render it muddy, are separated, and form a sediment called *lees*, after which the wine becomes clear. But though the operation is then considered as finished, and the fermentation apparently ceases, it does not really cease; and it ought to be continued in some degree if we would have good wine. In this new wine a part of the liquor probably remains that has not fermented, and which afterwards ferments, but

so slowly as to be imperceptible. The effects of this fermentation are the gradual increase of alcohol, and of the separation of the tartar from the wine. As the taste of tartar is harsh and disagreeable, it is evident that the wine, which by means of the insensible fermentation has acquired more alcohol, and has disengaged itself of the greater part of its tartar, ought to be much better and more agreeable; and for this reason chiefly old wines are universally better than new. But insensible fermentation can only ripen and improve the wine if the sensible fermentation has regularly proceeded, and been stopped in due time. We know certainly that if a sufficient time has not been allowed for the first period of the fermentation, the unfermented matter that remains, being in too large a quantity, will then ferment in the bottles or close vessels, in which the wine is put, and will occasion effects so much more sensible the sooner the first fermentation shall have been interrupted; hence these wines are always turbid, emit bubbles, and sometimes break the containing vessels, from the large quantities of air disengaged during the fermentation. We have an instance of these effects in champagne, and in other wines of the same kind, the sensible fermentation of which is interrupted, or rather suppressed, that they may have this sparkling quality. It is well known that these wines sparkle and froth when they are poured into glasses; and that they have a taste much more lively and piquant than still wines. These effects are caused by a considerable quantity of carbonic acid, which is disengaged during the confined fermentation that the wine has undergone in close vessels. When this gas is entirely disengaged from these wines they no longer sparkle, but lose their brisk taste and become insipid. Such are the qualities which wine acquires in time, when its first fermentation has not continued sufficiently long. These qualities are given purposely to certain wines to indulge taste or caprice. Wines for daily use ought to have undergone so completely the sensible fermentation that the succeeding fermentation shall be insensible, or at least very nearly so. Wine, in which the first fermentation has been too far advanced, is liable to worse inconveniences than that in which the first fermentation has been too quickly suppressed; for every fermentable liquor is, from its nature, in a continual intestine motion, more or less strong according to circumstances, from the first instant of the spirituous fermentation till it is completely purified; hence from the time of the completion of the spirituous fermentation or even before, the wine begins to undergo the acid or acetous fermentation. This acid fermentation is very slow and insensible, when the wine is included in very close vessels and in a cool place; but it gradually advances, so that in a certain time the wine becomes completely sour. This evil cannot be remedied, because the fermentation may advance, but cannot be reverted. Wine merchants, therefore, when their wines become sour, can only conceal or remove this acidity by alkalis or alkaline earths. But these additions communicate to wine a dark, greenish colour, and a taste which though not acid is somewhat disagreeable. Besides, calcareous earths accelerate, considerably, the total destruction and putrefaction of the wine. Oxides of lead, having the property of forming, with the acid of vinegar, a salt of an agreeable saccharine taste, which does not alter the colour of the wine, and which, besides, has the advantage of stopping fermentation and putrefaction, might be employed to remedy the acidity of wine, if lead and all its preparations were not so poisonous. If wine contain oxide of lead, it may be discovered by transmitting through a portion of it in a wine-glass, a current of sulphur-



ated hydrogen gas, which will cause a glistening, black precipitate of sulphuret of lead.

When the wine has attained a sufficient degree of maturity it is freed from the lees by being racked into a clean cask; and in order to prevent a renewal of the fermentation it is subjected to the operation of sulphuring. This process is generally performed by burning sulphur matches in the cask into which the wine is to be racked, and should the fermentation still continue this must be renewed as often as is necessary. Sometimes must, strongly impregnated with sulphurous acid gas, is added to the wine, and answers the same purpose. After sulphuring, the greater proportion of wines require to be further clarified, or fined, before they attain a due brightness. For this purpose various substances are used, which, by their chemical or mechanical action, unite with such materials as disturb the purity of the wine, and sink with them to the bottom. The substances in general use are isinglass and the white of eggs; but as these are of a putrescent nature gum-arabic has been used instead of them. In Spain the white wines are sometimes clarified with fuller's earth: powdered marble, gypsum, heated flints, beech-wood chips, sand, &c., are also used.

We shall now give a short account of the treatment which the sparkling white wines of Champagne receive. The greater portion of these wines are prepared from red grapes, the juice of which is generally more saccharine than that of white grapes. After the grapes have been trodden the skins, &c., are submitted to a pressure, which gives pink wine. The wines of different growths are mixed together in such proportions as have been found advantageous, and the mixture is put into barrels containing each about 45 gallons, which are placed where they can have a temperature of between 60° and 70°. Fermentation goes on gradually for eight to fifteen days, according to temperature, after which the casks are removed to cool cellars having a temperature of 40° to 50°. The sudden decrease of temperature stops active fermentation, and causes it to go on slowly. The wine is allowed to remain in the casks for a considerable time, being bottled in the month of April, after being racked and clarified three times. The high class champagne wines still contain enough sugar not to require the addition of any, and sufficient to produce by the slow fermentation which goes on in the bottles the carbonic acid that causes them to froth and sparkle. The less rich wines receive into each bottle a certain quantity of white wine, in which cane-sugar is dissolved. The bottling and preservation of the sparkling wines require a great deal of attention. The corks have to be wired down so as to counteract the pressure of the gas generated within, and they are then arranged horizontally in rows. When, by the formation of deposits, or by the breaking of some of the bottles, it is known that the fermentation has gone to some length, the bottles are taken down into a cellar with a constant temperature of 40°. There they are again ranged in bins, and left for eighteen months at least, during which time a great number are broken by the pressure of the gas, especially in the summer months. When the sediment has had plenty of time to settle and the wine is limpid the bottles are taken from the bins and are stuck neck downwards in shelves perforated with holes. The bottles are shaken a little from time to time, and the sediment accordingly falls and adheres to the cork. The next operation is that of 'disgorging' (*degorgage*), as it is called. The 'disgorgier,' holding the bottle neck downwards, cuts the wire, rapidly draws the cork, and allows the sediment and a little wine to escape, almost instantaneously turning the bottle right end uppermost again, and wiping out the throat. This

operation requires great manual dexterity. The bottles are now passed to the 'equaliser,' who has to see whether the disgorgier has withdrawn unequal quantities of wine, and has to bring up the quantity in each bottle to the proper amount. Lastly, to each bottle is added a certain quantity of sugary liquor, the composition of which varies according to the taste of the inhabitants of the countries for which the wine is destined. This liquor increases the sparkling property of the wine. The bottles are now corked and wired once more, the cork and neck being enveloped in tin-foil.

Wine is almost always *medicated*, as it is called, before it is ready for the market; and very little wine is, in fact, a simple liquor. One of the most common processes of medication is mixing different wines together, sometimes of the same quality or country, but often of different ones. For this purpose that season is chosen in which the wines show a disposition to renew their fermentation. They are then said to *bear the fret*; and the operation is called *fretting-in*. The mixing of different wines always disturbs both, so that they tend to ferment again; and when the fermentation is determined they form a proper compound. In the wine countries particular grapes (rough, or coloured, or astringent, or high-flavoured) are cultivated for the mere purpose of mixing their juice with that of others. Another process is that of mixing brandy with the natural liquor. The tendency of this substance, thus mixed, is to decompose the wines in process of time, causing the extractive matter or mucilage to be deposited, as well as the colour, and at the same time to destroy their lightness and flavour. Few wines naturally possess much flavour; and the same is true, to a great degree, of colour. It is therefore a part of the business of the manufacturer to communicate artificially such a flavour and colour as the taste of the customer demands. The flavour is often generated by the application of bitter almonds, oak chips, orris-root, wormwood, rose-water, &c., while colour is produced by the use of dye-woods, logwood, &c., berries, oak chips, burned sugar, iron, &c.

Wines, with respect to their properties, may be divided into three principal divisions, namely:—1. The *astringent* or *dry* wines; such are those of Alcant, Bordeaux, Burgundy, Sherry, Madeira, &c. These wines contain a small quantity of tannin, which gives them a taste more or less harsh. 2. The *sweet* wines; such are Malaga, Malmsey, Tokay, Cyprus, &c., containing a tolerably large quantity of sugar which has escaped fermentation. And, 3. the *foaming* or *sparkling* wines; such as Champagne, which, being bottled up before they have undergone a perfect fermentation, contain a large quantity of carbonic acid in solution. The principal ingredients contained in wines are water, alcohol, a little mucilage, colouring principles, supertartrate of potash, tartrate of lime, acetic acid; and some of them contain, besides, carbonic acid; finally, a very volatile principle, to which the peculiar flavour or *bouquet* of the wine has been attributed, and which is *ananthic* acid. To the presence of alcohol they are principally indebted for their stimulant and diffusible properties; and this principle, which may be separated by distillation, exists in them in very different proportions. From recent analysis we learn that the amount of alcohol is greatest in port, in which it is present to the extent of from about 20 to 23 per cent.; then follow, in decreasing strength, Madeira, Sherry, Champagne, Burgundy, Rhine wine, claret, and, lastly, Moselle, which contains only from 8.5 to 9.5 per cent. of alcohol.

Of the sparkling wines, Champagne may be considered the best. It is the least noxious when im-

derately indulged in; it intoxicates speedily, and the excitement is of a more lively and agreeable character and of shorter duration than that caused by any other species of wine, and the subsequent exhaustion less. The sparkling wines are, however, too often drunk long before they arrive at maturity, when they are least wholesome. (See CHAMPAGNE.) The red wines of Burgundy are distinguished by greater spirituousity and a powerful aroma or *bouquet*; they are much more heating than many other wines which contain a larger proportion of alcohol. The higher priced kinds (at and above 4s. a bottle) are of great service in cases of debility with nervous exhaustion. (See BURGUNDY WINES.) With less bouquet and spirit, but with more astringency than the Burgundies, the Bordelais wines (called by the English claret) are perhaps of all kinds the safest for daily use; they are the best of all cheap and light wines, and do not intoxicate so readily as most others. (See BORDELAIS WINES.) Good old port wine abounds in the astringent principle, and is of extreme value in fever cases and in other forms of debility; but the gallic acid contained in port renders it unfit for weak stomachs, and it should not be partaken of by persons of over forty who have a predisposition to gout. The price of genuine port has risen considerably in recent years, and it can be said with safety that all liquors bearing this name sold at or under 4s. a bottle are little else than British spirits which have been sent to the Continent to be transformed into wine. Even the wine manufacturers of Oporto strengthen their ports intended for the British market with too much brandy. (See PORT.) For a long time the vintages of Spain, and especially the wines known as sack, were preferred to all others for medicinal purposes, and those of Xeres (sherry) are still the wines the most generally drunk by the British, sherry being the only wine admitted into the Pharmacopoeia. Of all the strong wines, however, those of Madeira, when of good quality, seem the best adapted to invalids, being fully as spirituous as sherry, but possessing a more delicate flavour and bouquet, and though often slightly acidulous, agreeing better with dyspeptic habits. For some time Madeira fell into disrepute, and in 1851 the *oidium* or grape-disease, temporarily stopped the trade, which has now, however, considerably revived. The distinctive elements of wine are to be had in abundance in the cheap light wines of the Rhine and the Moselle; in the Hungarian, Austrian, and in some Greek wines. Large quantities of wine are now made in the United States, principally from the Catawba, a native American grape, but little has as yet been exported; the sparkling Catawba made at Cincinnati and St. Louis is a good imitation of Champagne. Much wine is now made also in California. The wines of the Cape of Good Hope (except Constantia) have never found much favour in this country; Cape ports and sherries, from the lowness of the price, did for a time secure some demand, but on the conclusion of the commercial treaty with France they were unable to compete with the superior European wines. Vine-growing and wine manufacture is now carried on in New South Wales, Victoria, and South Australia. The wines are of different qualities, mainly red, which resemble Burgundy or the fuller wines of the south of France; the white wines resemble Sauterne or Muscatel, but are more or less disguised by the addition of alcohol. Of the ancient wines those most celebrated by the Greeks were the Chian and Lesbian, the former famous for its exquisite aroma, the latter for its delicious flavour. The finest wines used by the Romans were the produce of Campania, and among these those which held the first place in the estimation of the Romans were the Cœcuban, Falernian, and Mamian.

The following table shows the amount of wine imported into Britain in 1901:—

Countries whence Imported.	Gallons.	Value.
France .....	5,517,828	£2,558,414
Spain .....	4,184,554	638,485
Portugal .....	8,908,665	1,120,537
Germany and Holland .....	1,447,800	843,491
Australia .....	786,379	132,034
Italy .....	348,064	60,216
Other countries .....	445,423	98,108
Total .....	16,546,206	£4,931,335

See Thudichum's Treatise on Wines (1893); Shaw's History of Wines (1864); Thudichum's and Dupré's Origin, Nature, and Varieties of Wine (1872); the article WINE in Thorpe's Dictionary of Applied Chemistry (vol. iii.); &c. See also VINE.

WING. See ORNITHOLOGY and FLYING.

WINNIPEG, the seat of government and commercial centre of the province of Manitoba, in the Dominion of Canada, is situated on the left bank of the Assiniboine, opposite the mouth of the Red River, 40 miles south of Lake Winnipeg, 1180 miles north-west of Montreal by the Canadian Pacific Railway, but 1843 by the United States route. The city is well supplied with water, gas, and electricity, and has several lines of street cars, electricity being wholly in use in these. The streets are wide, well-paved, and lined with houses of stone and brick, some of the buildings being of superior style. Here are the residence of the lieutenant-governor, the provincial parliament-house, the law courts, the post-office, city-hall, the Anglican and Roman Catholic cathedrals, various other churches (several of them fine buildings), a number of schools, one or two large and fine hotels, &c. There is a well-endowed university with four colleges affiliated to it. As Winnipeg is the centre of an extensive fertile district it does a large trade in wheat (the staple), and in cattle, dairy-produce, and lumber. There are some very large flour-mills. Previous to 1870 the town was simply the chief trading post of the Hudson Bay Company (which still has its Canadian head-quarters here), having in that year a pop. of about 300, consisting chiefly of descendants of the early settlers (in the Red River Settlement as it was called) and half-breeds. In 1873 the city was incorporated, when the inhabitants did not number over 2000. Such was its prosperity in the following years that in 1891 the population, according to the census, numbered 25,639, and in 1901 it was 42,340.

WINNIPEG, a lake and river in Canada. The lake, the largest of a remarkable chain, between lat. 50° 20' and 53° 45' N.; lon. 95° 30' and 99° W., about 850 feet above sea-level, is of very irregular shape, and stretches from S.E. to N.W. for about 250 miles, with a breadth varying from 5 to 70 miles. Its principal feeder is the Saskatchewan, which it receives on the north-west; other important feeders are the united Red and Assiniboine Rivers, and the river Winnipeg. It discharges itself in the north by a chain of lakes, which pour their waters into the Nelson.—The river flows from the Lake of the Woods into the south-eastern extremity of the lake. It is a large stream, full of rapids and cascades, one of which, called the Fall of the Moving Waters, is of the grandest description.

WINSFORD, a town of England, in Cheshire, 5 miles south of Northwich, a great seat of the salt industry. Pop. (1891), 10,440; (1901), 10,382.

WINTER, the coldest season of the year, in Great Britain comprising the months of December, January, and February. The astronomical winter begins on the shortest day (December 22) and ends with the vernal equinox (March 21). In the southern

hemisphere it is, of course, winter when it is summer in the northern. (See SUMMER.) In the northern hemisphere the winter has but eighty-nine days, while in the southern it has ninety-three days; the northern winter occurring during the earth's perihelion, and the winter of the southern hemisphere during its aphelion. In the torrid zone and parts adjacent there is no proper winter, but a rainy season, which takes its place. (See CLIMATE.)

**WINTER-GREENS** (*Pyrolaceæ*), a natural order or group of gamopetalous dicotyledonous plants, often classed with the heaths (*Ericaceæ*). They are natives of Europe, North America, and northern Asia, and are found in fir-woods and similar situations. They are shrubby or herbaceous plants, with round naked stems. Several species are found in Britain. In America the name is commonly given to the *Gaultheria procumbens*, a plant of the order *Ericaceæ*, with slender creeping stems and erect branches, which bear tufts of evergreen leaves and drooping white flowers, succeeded by fleshy, bright-red berries. A pungent volatile oil, called oil of winter-green, is extracted from the berries and used in medicine as a stimulant, also for flavouring syrups and in perfumery.

**WINTER SOLSTICE.** See SOLSTICE.

**WINTERTHUR**, a town of Switzerland, in the canton of Zürich, on the Eulach, and 12 miles north-east of Zürich. It is situated among hills covered with vines. The principal industries are cotton spinning and weaving, and silk-weaving. Tanning, soap-making, metal-founding, brewing, and the manufacture of pottery, boots and shoes, chemicals, and machinery are also carried on. The trade is of considerable importance. Pop. (1901), 22,635.

**WIRE-DRAWING** is the art of drawing out any of the ductile metals into long and regular threads of a uniform diameter. (See DUCTILITY and DIVISIBILITY.) The process of wire-drawing is extremely simple, the apparatus employed consisting only of a draw-plate and a draw-bench. The draw-plate is a thick plate of fine steel perforated with holes of various sizes, from that of the largest to that of the smallest wire required. They gradually diminish in diameter from one side of the plate to the other, and they differ among themselves in diameter by almost imperceptible gradations. The draw-bench consists of a horizontal roller or axis turned by levers. A strap or chain is coiled round the roller, and at the end of the strap is a pair of pincers for taking hold of the end of the piece of metal to be drawn. The draw-plate being made to bear against the draw-bench, and the levers being turned, the metal is pulled by the pincers through a hole in the draw-plate. It is afterwards drawn successively through smaller holes, being coiled upon the roller as it is drawn out. As the metal becomes stiff and hard by the repetition of this process, it is necessary to anneal it from time to time to restore its ductility. It is also occasionally immersed in an acid liquid, to loosen the superficial oxide which is formed in the process of annealing. When a considerable length of wire of uniform thickness is required, the holes in the draw-plate must be jewelled. Rubies, sapphires, and chrysolites are used for this purpose.

**WIRE-ROPE.** The making of wire-rope is a comparatively recent manufacture, which has, however, already attained a high development. Iron and steel wire are generally used for the purpose, though the former has been almost wholly superseded by the latter. The principal applications of wire-rope are for winding in coal-mines, &c., for making the standing rigging of ships, for pulling the ploughing implement in steam-ploughing, and for making electric cables. In steam-ploughing only steel wire-rope can be used. See ROPE.

**WIREWORM**, the common name of the larva or grub of several species of beetles known as skip-jacks or click-beetles (*Agriotes lineatus*, *A. obscurus*, *A. sputator*, *Athous rufocaudis*). The larvae are so named from their resemblance to a piece of wire in shape, appearance, and toughness, and they do an enormous amount of damage to root, grain, and fodder crops. They are of a yellowish colour, with six short legs near the head and a sucker-foot near the tail, and they live from three to five years in the larval state beneath the surface of the ground before becoming pupas. For methods of prevention and remedy consult Miss Ormerod's *Manual of Injurious Insects* (1890) and other works on economic entomology.

**WIRKSWORTH**, a market-town of England, in Derbyshire, 13 miles N.N.W. of Derby, with a thirteenth-century church (restored), a town-hall, a moot-hall, an institute, grammar-school, and a cottage hospital. The working of limestone quarries and the weaving of tape are the chief industries, but formerly the town was the centre of a lead-mining region. Pop. in 1891, 3725; in 1901, 3807.

**WISBECH**, a municipal borough of England, in the Isle of Ely, Cambridgeshire, on the Nene, over which is an iron bridge. The town is generally well built, and contains a parish church and other places of worship, corn-exchange, public hall, museum of natural history and antiquities, a grammar and other schools, a working-man's institute, &c. Various manufactures, and a trade principally in agricultural produce and imports of coal and timber, are carried on. Owing to the improved navigation of the Nene vessels of nearly 2000 tons have discharged their cargoes in the town. Among its natives are Clarkson (to whom a memorial has been erected) and Godwin. The Great Eastern and the Midland and Great Northern Joint Railway have each a station here. It gives name to a parl. div. of Cambridgeshire. Pop. (1891), 9395; (1901), 9831.

**WISBY**, or Visby, a town in Sweden, on the western shore of the Island of Gotland, of which it is the capital. It is one of the oldest towns in the north of Europe, and was once a leading member of the Hanseatic League; and with its walls and towers almost as entire as in the thirteenth century presents a striking appearance. The chief objects of note are the cathedral, built in 1190; the Helge-Andes-kyrka (church of the Holy Ghost), and several other interesting ruined churches; a gymnasium, a large hospital, and workhouse. The harbour is good, and has an active trade. Pop. (1890), 7102; (1900), 8376.

**WISCONSIN**, a river in the United States, has its sources in several small lakes on the northern frontiers of Wisconsin state; flows first south, then south-west, and enters the Mississippi on the left below Prairie-du-Chien after a course of over 600 miles. It is obstructed by many shoals and bars.

**WISCONSIN**, one of the United States of North America, bounded north by Lake Superior, north-east by Michigan, east by Lake Michigan, south by Illinois, and west by Iowa and Minnesota; area, 56,040 square miles. It consists of an undulating plateau, varying from 600 to 1500 feet above sea-level. The highest land stretches centrally from N.N.W. to S.S.E., dividing the waters carried to the lakes from those carried to the Mississippi. From this high land the descent in the north to Lake Superior is very abrupt, and the surface is much broken by torrents and cascades. The principal river is the Mississippi, which, with its tributary St. Croix, forms the greater part of the western and the whole of the south-western boundary, and is augmented by numerous other streams, of which the most important are the Chippewa and the Wisconsin. Lake Winnebago is of considerable magnitude.

About nine-tenths of the inhabitants are employed in farming and grazing. The principal crops cultivated are, in order of importance, oats, Indian corn, barley, root-crops, and tobacco. Flour, grain, and dairy produce are extensively exported. The manufactures, which are rapidly increasing, include pig and rolled iron, rails, cotton goods, &c. The most important mineral worked is lead, which, as well as zinc, occurs in the south-west; copper, iron, coal, and lime are also found. The felling and sawing of timber forms an extensive branch of industry. There are over 6000 miles of railway in the state. Education is compulsory for all children between the ages of seven and fifteen years. There are ten universities and colleges, the most important being the State University at Madison. The state is divided into seventy counties, and the principal towns are Milwaukee, La Croix, Oshkosh, and Madison (the capital). Pop. in 1870, 1,054,670; in 1890, 1,686,880; in 1900, 2,069,042, including a large number of Germans.

WISDOM, BOOK OF. See JESUS.

WISEMAN, NICHOLAS PATRICK STEPHEN, cardinal and archbishop of Westminster, son of an Irishman who went to Spain to engage in commerce, was born in Seville on Aug. 2, 1802. After his father's death in 1804 he was taken by his mother to Waterford, and in that city he received his earliest education. From 1810 to 1818 he was a student in St. Cuthbert's College at Ushaw, near Durham, and towards the end of the latter year he went to Rome. He attended the English College there, and also studied oriental languages at the Sapienza Archigymnasium. In 1824 he received the degree of D.D., and in the following year he was ordained priest. The publication of Horæ Syriacæ in 1828 gained him a considerable reputation as an orientalist, and led to his appointment as supernumerary professor in the Sapienza. He was appointed vice-rector of the English College in 1827 and rector in 1828, and he held the latter post till 1840. In 1835 he delivered two noteworthy series of lectures, one at Rome On the Connection between Science and Revealed Religion, and another in the Sardinian Chapel, London, On the Principal Doctrines and Practices of the Catholic Church. Both series were published in 1836. The Dublin Review was founded by him in 1836 in conjunction with Daniel O'Connell and M. J. Quin. In 1840 he was appointed by the pope co-adjutor to Dr. Walsh in the midland district, and later in the same year he was consecrated Bishop of Melipotamus in *partibus infidelium* and president of St. Mary's College, Oscott. He went to the London district in 1848 as pro-vicar-apostolic, and next year he succeeded Dr. Walsh as vicar-apostolic there. When Pius IX. introduced a regular Roman Catholic hierarchy into England in 1850, Wiseman was appointed Archbishop of Westminster and created a cardinal. The action of the pope caused an indignant outburst from zealous Protestants, and led to the passing of the Ecclesiastical Titles Act of 1851, which made the new system illegal, but after being a dead letter from the first, was repealed in 1872. Cardinal Wiseman died in London on Feb. 15, 1865. He was a man of great ability and wide learning, being in particular a linguist of unusual attainments. The Sylvester Blougram of Browning's Bishop Blougram's Apology is an unfavourable representation of Wiseman. His published works include the following: The Real Presence of the Body and Blood of our Lord Jesus Christ in the Blessed Eucharist (1836); Essays on Various Subjects (1853; new ed., 1888); Fabiola, or The Church of the Catacombs (1854), a charming story which has been popular in many countries; Recollections of the Last Four Popes

(1858); The Hidden Gem (1858), a drama; Sermons on our Lord Jesus Christ and on His Blessed Mother (1864); Sermons on Moral Subjects (1864); &c. See the biography (1897) by Wilfrid Ward.

WISHART, GEORGE, Scottish reformer and martyr, was born about 1513, probably at Pittarrow, in the parish of Fordoun, Kincardineshire. He appears to have taught the Greek New Testament at Montrose, and to have been charged with heresy by the Bishop of Brechin in 1538. He fled to England, and soon afterwards he is found lecturing at Bristol. The dean of Worcester charged him with the heresy of denying the merit of Christ, and after condemnation by the Archbishop of Canterbury and other prelates he publicly recanted. He went to the Continent about 1540, and returned to England some three years later, when he became a member of Corpus Christi College, Cambridge. Soon afterwards he returned to his native country, where he preached in support of the Lutheran doctrines in Montrose, Dundee, Ayrshire (especially Galston and Mauchline), Leith, and Haddington. He met with much support and also strong opposition, and attempts were made upon his life. Near the end of 1545 he was seized by the Earl of Bothwell in Ormiston Hall, Haddingtonshire, and in January, 1546, he was delivered up in accordance with a Privy Council warrant to the governor of Edinburgh Castle, who in turn gave him over to Cardinal Beaton, who took him to St. Andrews. After trial by a convocation of prelates he was condemned for heresy, and on March 1, 1546, he was burned in front of the cardinal's castle. Beaton's murder soon afterwards was to some extent carried out in revenge for Wishart's death, but the identification of George Wishart with the Wishart who is known to have plotted against Beaton is at least doubtful. Wishart translated from the Latin the Helvetic Confession (published 1548). See the general histories of Scotland, Grub's Ecclesiastical History of Scotland, Rogers's Memoir (1876), the Dictionary of National Biography, &c.

WISHAW, a police burgh of Scotland, in Lanarkshire, 14 miles east by south of Glasgow, on the Caledonian Railway. It is pleasantly situated on the face of a hill, and is a thriving place, having rapidly increased in recent years. It has places of worship belonging to the Established, the United Free, and other denominations, a town-hall, court-house, board and other schools, several branch banks, &c. In the neighbourhood there are several large coal-mines, iron, steel, and nail works, fire-clay brick-works, railway-wagon works, and a distillery. Pop., including the village of Cambusnethan, which forms part of the burgh, in 1881, 13,112; in 1891, 15,252; and in 1901, 20,873.

WISMAR, a seaport of Germany, in Mecklenburg-Schwerin, on a bay of the Baltic, 19 miles north of Schwerin. Its manufactures are of some importance, and the trade, favoured by an excellent harbour, is considerable. Wismar lost much of its importance from the rise of Lübeck. Pop. (1900), 20,222.

WISSEMBOURG. See WEISSENBURG in SUPP.

WISTARIA, a genus of leguminous plants consisting of deciduous twining and climbing shrubs, natives of China and North America. Several have been introduced into Britain, and when in flower they form some of the handsomest ornaments of the garden. *W. frutescens* is a species belonging to the United States.

WIT is the faculty of detecting, and presenting in a lively manner, similarities in things in which common observers see only diversity. The finding of such similarities presupposes comparison; and wit-

might therefore be defined a facility in the comparing power to discover unexpected relations, or a playful exercise of the power of comparison. We sometimes apply the name of *wit* to various other sorts of ingenious thoughts expressed in words, in which sense it corresponds to the French *bon mot*. Wit is the more striking the more easily it brings together things which to the common observer appear distinct, and the less obvious the resemblances which it discovers. It is intimately connected with vivacity and quickness of imagination, and is much improved by practice. The similarities or differences which wit points out need not actually exist, but may be merely the creation of the imagination. There must, however, be some ground for the relation presented, though it may be a trifling one, which is called the *point of comparison* (*tertium comparationis*). Dugald Stewart inclines to believe that the pleasure afforded by wit is founded to a considerable degree on the surprise of the hearer at the command which the man of wit has acquired over a part of the constitution so little subject to the will. Hence it is that we are more pleased with a *bon mot* which occurs in conversation than with one which appears in print; and we never fail to receive disgust from wit when we suspect it to be premeditated. Dr. Campbell remarks that a witty repartee is infinitely more pleasing than a witty attack, and that an allusion will appear excellent when thrown out extempore in conversation, which would appear execrable in print.

**WITCH, WITCHCRAFT.** In the days when this superstition prevailed a witch was believed to be a person who had acquired supernatural power by entering into a compact with evil spirits. In this sense of the word the notions of witchcraft are essentially of modern origin; although in respect of the powers attributed to them, however derived, the votaries of Hecate among the Greeks, and the *strigæ* and *veneficæ* among the Romans, as well as the witches of the Scriptures, correspond sufficiently with the witches of modern superstition. Among the early Christians the doctrine of the active agency of the spirit of evil in human affairs became more fully developed than it had previously been; and it has been a familiar notion with Christian writers from an early period, that the gods of the ancients were actually wicked spirits, who had led the nations astray from God, and blinded them to destroy them. Hence they have attributed to the heathen oracles the character of prophecy, but ascribed their prophetic powers to the devil; and it is well known that the Sibylline oracles have been quoted by Christian theologians in proof of the divine character of the Saviour. 'There appears nothing,' says Sir Walter Scott (*Demonology and Witchcraft*), 'inconsistent in the faith of those, who, believing that, in the elder time, fiends and demons were permitted an enlarged degree of power in uttering predictions, may also give credit to the proposition that, at the divine advent that power was restrained, the oracles silenced, and those demons who had aped the divinity of the place were driven from their abode on earth, honoured as it was by a guest so awful.' The opinion here alluded to is the commonly-received opinion that the heathen oracles were struck silent at the time of the coming of Jesus Christ. (See **DEMON** and **DEVIL**.) The legends of the saints, the tales of the trials and temptations of holy anchorites, in many of which the devil plays so important a part, contributed to extend and confirm the popular notions; and a direct diabolical agency being once assumed and allowed, there was nothing too absurd to be engrafted on it. The insane fancies of diseased minds, unusual phenomena of nature, and the artful machinery of designing malignity, ambi-

tion, or hypocrisy, were all laid at Satan's door. In the *Sachsenspiegel* (which see) of the thirteenth century the sorcerer and the witch are ordered to be burned; but it was not until the fifteenth century that the proceedings against witchcraft assumed their most hideous form. In 1484 Innocent VIII. issued a bull directing the inquisitors to be vigilant in searching out and punishing those guilty of this crime; and the form of proceeding in the trial of the offence was regularly laid down in the *Malleus Maleficarum* (*Hammer of Witches*), which was issued soon after by the Roman See. The bull of Innocent was enforced by the successive bulls of Alexander VI. (1494), Leo X. (1521), and Adrian VI. (1522). Of the extent of the horrors which followed during two centuries and a half history gives us her record. We are told that 500 witches were burned at Geneva in three months, about the year 1515; and that 1000 were executed in one year in the diocese of Como; in Würzburg, from 1627 to 1629, 157 persons were burned for witchcraft; and it has been calculated that not less than 100,000 victims must have suffered in Germany alone from the date of Innocent's bull to the final extinction of the prosecutions. The last execution in Würzburg took place so late as 1749, and a witch was burned in the Swiss canton of Glarus in 1780. In Posen an execution took place for the crime as late as 1793. Bamberg, Paderborn, Würzburg, and Treves were the chief seats of this delusion in Germany. In England the state of things was no better; and even the Reformation, which exploded so many other errors, seems to have had no influence upon this. Individual cases of trial for witchcraft occur in this country previous to the enactment of any penal statute against it; and the successive statutes of Henry VI., Henry VII. (1541), Elizabeth (1563), and James I. (1604), show the extent of the legislative proceedings in regard to this imaginary crime here.<sup>1</sup> The judicial proceedings against witches reached their climax in the time of the Long Parliament, during the sitting of which 3000 persons are said to have been executed, after conviction for the supposed crime, besides whom many suspected witches perished by the hands of the mob. In these cruel proceedings Matthew Hopkins, the notorious 'witch-finder,' played a prominent part. Judicial convictions were checked chiefly by the firmness of Holt, who, in about ten trials, from 1694 to 1701, charged the juries in such a manner as to cause them to bring in verdicts of acquittal. Yet in 1718 a Mrs. Hickes and her daughter, nine years of age, were hanged for selling their souls to the devil, and raising a storm by pulling off stockings and making a lather of soap. The number of those put to death in England has been estimated at about 30,000! The first law against witchcraft in Scotland was passed in 1563. The last victim executed in that country perished in 1722. Prosecution for witchcraft was abolished both in England and Scotland by 9 Geo. II. cap. v. (1736), which made all persons pretending to use the same punishable by imprisonment. By a subsequent act passed in the reign of Geo. IV. they are made punishable as rogues and vagabonds. America also furnishes a chapter in this dreadful history of human folly. In 1692 nineteen persons were executed, and one pressed to death, in Salem and

<sup>1</sup> 'To deny the possibility, nay, actual existence, of witchcraft and sorcery,' says Blackstone (*Commentary on the Laws of England*, b. iv. chap. 4, sec. 6), 'is at once flatly to contradict the revealed word of God in various passages both of the Old and New Testament; and the thing itself is a truth to which every nation in the world hath in its turn borne testimony, either by examples seemingly well attested, or by prohibitory laws; which, at least, suppose the possibility of a commerce with evil spirits.'

its vicinity, for the crime of witchcraft; but though several were condemned and many accused, there were no executions subsequent to that year. In France executions for witchcraft were prohibited by an edict of Louis XIV. as early as 1670. As above indicated, not only the populace, but men of learning and those from whom better might have been expected, were slaves to the belief in witchcraft. John Wesley, for instance, for similar reasons to those adduced by Blackstone, clung to the belief, which is not even yet quite extinct. Among the first enlightened opponents of the superstition must be mentioned Reginald Scot (which see), whose able *Discoverie* (that is, 'exposure') of Witchcraft appeared in 1584, and led to the publication of James I.'s *Dæmonologie* (1597), as a 'counterblast'.

According to the notions of the times above indicated, witches were able, with the assistance of the devil, not only to foretell events, but to produce mice and vermin; to deprive men and animals, by touching them, or merely breathing upon them, of their natural powers, and to afflict them with diseases, to raise storms, to change themselves into cats and other beasts, &c. The compact with the devil was sometimes express, whether oral or written, when the witch abjured God and Christ, and dedicated herself wholly to the evil one; or only implied, when she actually engaged in his service, practised infernal arts, and renounced the sacraments of the church. The express compact was sometimes solemnly confirmed at a general meeting, over which the devil presided, and sometimes privately made by the witch signing the articles of agreement with her own blood, or by the devil writing her name in his black book. The contract was sometimes of indefinite duration, and at others for a certain number of years. The witch was bound to be obedient to the devil in everything, while the other party to the act promised her wealth and treasures; but the gold thus obtained usually turned into some worthless material in the hands of its possessor. These and similar facts were gathered from the *voluntary confessions* of persons accused of this crime, whose ingenuity was generally guided by the application of what was then called '*gentle torture*'. General assemblies of witches (called witches' sabbaths) were held yearly or oftener, in which they appeared entirely naked, and besmeared with an ointment made from the bodies of unbaptized infants. To these meetings they rode from great distances on broomsticks, pokers, goats, hogs, or dogs; the devil taking the chair under the form of a goat. Here they did homage to the prince of hell, and offered him sacrifices of young children, &c., and practised all sorts of license until cock-crowing. A witches' sabbath forms one of the scenes in Goethe's *Faust*. See Sir Walter Scott's *Demonology and Witchcraft*; Ennemoser's *History of Magic*; Wright's *Narratives of Sorcery and Magic*; Williams's *The Superstitions of Witchcraft*; Conway's *Demonology and Devil Lore*; Putnam's *Witchcraft of New England*; Sharpe's *History of Witchcraft in Scotland*; Bell's *Obeah*; *Witchcraft in the West Indies*; Baissac's *Les grands Jours de la Sorcellerie*; Nevins's *Witchcraft in Salem Village* (1892); and Kimball's *Witchcraft illustrated* (1893). See also MAGIC, EVIL EYE, DIVINATION, &c.

**WITCH-HAZEL** (*Ilex verticillata*), a North American shrub, remarkable for putting forth its flowers late in autumn, when most forest-trees are parting with their leaves, and maturing its seeds the next summer. It grows 6 or 8 feet high, dividing at the base into several cylindrical grayish branches; the buds and young shoots are covered with short down; the leaves are obovate or oval, wavy-toothed; the flowers are clustered, yellow and showy, having

long and linear petals. It yields a valuable drug known as *hazeline*.

**WITENA-GEMOT**. See **ANGLO-SAXONS**.

**WITHER**, GEORGE, an English poet, was born in Hampshire, on June 11, 1588. He was educated at Magdalen College, Oxford, and afterwards entered himself a student of Lincoln's Inn. Here he paid more attention to the muses than to law, and in 1613 published his celebrated satires entitled *Abuses Stript and Whipt*, the severity of which led to his confinement in the Marshalsea, where he wrote his *Satire to the King*, which procured his release. In 1615 he published his *Shepherd's Hunting*, written during his imprisonment in the Marshalsea, the most poetical of all his works. Attaching himself to the Puritans he was violently assailed by their opponents. He took an active part on the side of Parliament when the civil war broke out, and sold an estate to raise a troop of horse. Under the Long Parliament he enjoyed various lucrative employments, but on the Restoration he lost all that he had amassed. A manuscript entitled *Vox Vulgi* found among his papers led to his arrest and committal to Newgate in 1660. In March, 1662, he was brought before the House of Commons and committed to the Tower, where he remained till his release in July, 1663. He died May 2, 1667. Among the works of Wither are the following: *Fidelia* (1617), to which his well-known lyric *Shall I wasting in Despair*, was added in 1619; *Wither's Motto* (1621); *Fair Virtue*, the *Mistress of Philarete* (1622); *The Hymnes and Songs of the Church* (1623), with music by Orlando Gibbons; *Hallelujah* (1641), another collection of hymns and similar poems; and *Prosopopeia Britannica* (1648). His works have been published by the Spenser Society (1870-83), and selections by Henry Morley (1891) and E. Arber (in *An English Garner*, 1880-83).

**WITNESS**, one who gives evidence in a court of justice. Witnesses may be compelled to appear and give evidence, their presence in the English High Court being enforced by a subpoena. The evidence is given upon oath or after a solemn declaration in a prescribed form. (See OATH.) A witness present by subpoena may refuse to be sworn if he has not been paid his lawful expenses; but once sworn he is bound to give his evidence. On the application of either party in a suit all the witnesses may be required to leave the court until they are called, and they are then called singly when their evidence is wanted. If, however, a witness is also a party in the suit he is entitled to remain in court during the whole time that the cause is under consideration. See EVIDENCE.

**WITNEY**, a market-town in England, in the county of Oxford, and 11 miles west by north of the city of Oxford. It has a town-hall, an old market-cross, a corn-exchange, a blanket-hall, a cruciform church with a lofty spire; manufactures of blankets, gloves, &c. Pop. (1901), 3574.

**WITT, DE**. See **DE WITT**.

**WITTEKIND**, or **WIDUKIND**, leader of the Saxons in their wars with Charlemagne, was a Westphalian chieftain, and first appears in 774. When the majority of the Saxon nobles submitted to Charlemagne at the Diet of Paderborn in 777, Wittekind fled to Siegfried, king of the Jutes. In 778, while Charlemagne was in Spain, he returned and laid waste the Frankish territory on the Rhine. The return of Charlemagne again compelled him to take to flight; but in 782 he fell upon and totally destroyed a Frankish army on the Sünfelberg, on the right bank of the Weser; in revenge for which Charlemagne caused 4500 Saxons to be massacred at Verden on the Aller. A general rising of the



Saxons was the consequence, Wittekind being again one of the leaders. The Saxons were defeated, however, in two great battles at Detmold and on the Hase, and all Saxony south of the Elbe was compelled to submit. Charlemagne is said to have conferred on Wittekind the title of Duke of Saxony, and granted him the territory of Engern as an allodial property. The tradition adds that he ruled with mildness and justice in his castle near Lübbecke till 807, when he met his death in an expedition against Duke Gerald of Suabia.

WITTEN, a town of Prussia, in the province of Westphalia, on the Ruhr, 27 miles north-east of Düsseldorf. Situated in an iron and coal district, the town has grown rapidly. The principal industry is in iron and steel, including extensive bar-iron and machine works. There are also manufactures of plate-glass, fire-brick, spirits, beer, &c. Pop. in 1890, 26,314; in 1900, 33,514.

WITTENBERG, a town in Prussia, in the province of Saxony, on the right bank of the Elbe, here crossed by a stone and a railway bridge, 45 miles E.S.E. of Magdeburg. It consists of the town proper and three suburbs, and was formerly a place of considerable strength. Its fortifications were levelled in 1873. It possesses high claims to notice as having been the cradle of the Reformation. In its once celebrated university, in 1815 united with that of Halle, Luther was professor of philosophy and theology; and on the doors of one of its churches he hung up the celebrated theses. The principal buildings and objects of interest in the town are the Schlosskirche (1490-99, completely restored in 1892), in which both Luther and Melancthon are buried, as well as their faithful friends and protectors, the electors, Frederick the Wise, whose monument is a fine work by Peter Vischer, and John the Steadfast, who has a monument by H. Vischer; the Stadtkirche, where Luther and Melancthon preached, and in which is a celebrated altar-piece by Cranach; the former Augustine monastery, now a seminary for ministers, with Luther's apartments; the houses of Melancthon and Cranach; the Luther House, with the Reformation Hall, containing memorials of Luther and the reformers; bronze statues of Luther and Melancthon in the market-place; a statue of Emperor Frederick III. in front of the Schlosskirche; the town-hall, with portraits of Luther and Melancthon; the towers of the former residential castle, destroyed in 1760; the gymnasium, theological seminary, orphan and ordinary hospitals. The spot where Luther burned the pope's bull, immediately outside one of the town gates, is marked by an oak railed round. The industrial establishments include iron-foundries, machine-works, manufactories for spirits, ethereal oils, pottery, electrical appliances, and bricks, steam saw-mills, &c., and there are markets for wool, cattle, &c. Wittenberg has suffered much from war, especially in 1760, when it was bombarded by the Austrians and a third of the houses were destroyed, and in 1814, when, after a siege of ten months, the Prussians took it from the French by storm. Pop. (1900), 18,333.

WITTENBERGE, a town of Germany, in Prussia (province of Brandenburg), on the right bank of the Elbe, near the confluence of the Stepenitz, 75 miles north-west of Berlin. The river Elbe is here crossed by a long bridge. The town has a Protestant and a Catholic church, a municipal hospital, a large railway-work, manufactures of wool, cloth, shoddy, oil, &c. It is of ancient origin, and was burned down in 1757. Pop. in 1900, 16,258.

WITWATERSRAND, or simply RAND, a chain of low heights on an elevated plateau in the Trans-

vaal (South Africa), forming the watershed between the Vaal, belonging to the Atlantic basin, and the Limpopo, belonging to the basin of the Indian Ocean. It runs from the W.N.W. to the E.S.E. for a distance of some 200 miles, and on its southern slope stands the town of Johannesburg, which is now world-famous as the centre of the Rand gold-mining industry. Gold was first discovered in the Rand district about 1884, and towards the end of 1886 the basin was proclaimed a gold-field. A rush took place, and ere long the busy cosmopolitan town of Johannesburg sprang up on what was formerly a barren waste. Excessive speculation led to a crash and a period of depression in 1889-90, but the industry soon recovered. The South African War of 1899-1902 again put a check to gold-production, but a period of great prosperity is now generally looked forward to. There has been considerable difference of opinion in regard to the extent and durability of the Rand gold-fields. The number of tons of ore milled in 1898 was 7,331,446 (711,877 in 1890), and the value of the total production in that year was £15,141,376 (£1,735,491 in 1890). The total output of gold in ounces for the whole of the Witwatersrand mines in 1898 was 4,355,330, the total for the whole of the Transvaal in that year being 4,555,015. Coal is also worked in the Rand district, especially at Boksburg.

WOAD, the name of a plant and of a dye obtained from it. The plant (*Isatis tinctoria*) belongs to the order Cruciferae, and is a herbaceous biennial, with entire, sagittate leaves which clasp the stem, small yellow flowers of the usual cruciferous type arranged in panicle racemes, and small, flat, elliptical, blackish pods. It is a native of central and southern Europe, and the blue dye contained in the leaves was known in ancient times. It is supposed to be the *ritrum* with which, as Caesar tells us, the ancient Britons dyed the skin, especially for battle. Formerly it was extensively grown in many districts, such as southern France, Piedmont, Thuringia, and parts of England, but the superiority and cheapness of indigo have all but killed the woad industry. The five Thuringian towns of Erfurt, Gotha, Langensalza, Tennstädt, and Arnstadt were formerly leading centres of woad-culture, and were known as the Woad Towns (*Waidstädte*). The first three of them still carry on the industry to some extent, and in some parts of Lincolnshire and Huntingdonshire it is not yet wholly extinct. The seed is sown in the early spring, and the leaves are ready for the first plucking in June. Two or more subsequent pluckings of leaves take place in the same year. The freshly-plucked leaves are crushed to a pulp and then allowed to dry. The pulp is next worked up into balls of some 5 inches diameter, which are carefully dried and stored. These are then ground to powder and submitted to a process of fermentation, which results in the formation of a pasty mass of the woad dye-substance. The basis of the colouring action in woad and in all indigo-yielding plants is a glucoside known as indican, and by acting on it with acids several colouring substances, notably the purple indirubin and the blue indigotin are obtained. Woad is now mostly used to assist fermentation in the so-called *woad vat* which is employed in the dyeing of wool by indigo. The vat contents consist of indigo, woad, bran, madder, and slaked lime in definite proportions, and fermentation proceeds at a temperature of about 120° F.

WODAN, WODEN, or ODIN. See NORTHERN MYTHOLOGY.

WODROW, ROBERT, ecclesiastical historian, son of a professor of divinity in Glasgow university, was

born at Glasgow in 1679. Having graduated in the university of his native city, he was in 1697 appointed university librarian, in which post he remained till his resignation in 1701. Two years later he received his license to preach, and in 1704 his relative, Sir John Maxwell, Lord Pollock, presented him to the living of Eastwood parish, near Glasgow, where he lived till his death on March 21, 1734. Wodrow is chiefly remembered for his History of the Sufferings of the Church of Scotland from the Restoration to the Revolution (two vols., 1721-22; 2nd edition, four vols., 1828-30), a work of great labour but somewhat one-sided. Other works by him are: *Memoirs of Reformers and Ministers of the Church of Scotland*, parts of which have been published by the Maitland Club (1834-45) and the New Spalding Club (1890); and *Analecta: or Materials for a History of Remarkable Providences*, mostly relating to Scotch Ministers and Christians (published by the Maitland Club, four vols., 1842-43). A Wodrow Society for the publication of the works of the early writers of the Church of Scotland was in existence from 1841 till 1847.

WOFFINGTON, MARGARET, familiarly known as *Peg Woffington*, actress, was born in Dublin about 1714, the daughter of a bricklayer. Her father died a pauper in 1720, and she had to earn her living at an early age. After a short engagement with *Madame Violante*, a rope-dancer, she sold fruit and vegetables in the streets, but in 1724 she was again engaged by *Madame Violante*, and first appeared as an actress in the part of Polly in *The Beggar's Opera*. Attracting the attention of regular managers, she appeared in various Dublin theatres, among her parts being *Ophelia* in 1737 and *Sir Harry Wildair* (in *The Constant Couple* by Farquhar) in 1740. Her great success in the latter rôle gained her an engagement at Covent Garden, where she made her debut to a London audience in 1740 as *Silvia* in *The Recruiting Officer* by Farquhar. For seventeen years she was the most popular actress in the metropolis, and appeared at Drury Lane and at Covent Garden in a great many female characters, both in comedy and tragedy, and also in male parts like that of *Sir Harry Wildair*. Many of her rôles were Shaksperian. In May, 1757, she broke down while acting *Rosalind* in *As You Like It* at Covent Garden, and after three years of ill-health she died in Westminster on March 28, 1760. She had great beauty of countenance and a most attractive manner, but her voice was somewhat unpleasing. Her moral character was weak. In the latter part of her life she went over from Roman Catholicism to Protestantism. She is commemorated in *Masks and Faces*, a drama by Taylor and Reade, and in *Peg Woffington*, a novel by Reade. There are biographies by A. Daly (1888) and J. F. Molloy (1884).

WOIWODE, an old Slavonic name for a general, afterwards used as a title of civil rank and authority. The princes of Wallachia and Moldavia were called *Woiwodes*, and this title was also applied at an early period to the Polish kings. It is still borne as a title of honour by some of the leading state officials in Montenegro.

WOKING, a market-town of England, in Surrey, on the river Wey, 5 miles north by east of Guildford. It has an ancient church of some interest, modern Anglican churches, a Roman Catholic church, Nonconformist places of worship, a well-known crematorium (1889), a cottage hospital, St. Peter's memorial home, &c. In the neighbourhood are the London Necropolis, an oriental institute, an industrial school, Surrey county asylum, a female convict prison, a male convict prison now used as

barracks, and the ancient manor-house of Sutton Place. There is a paper-mill, and also nursery gardens. Pop. in 1891, 9776; in 1901, 16,222.

WOKINGHAM, a municipal borough of England, in Berkshire, 6 miles south-east of Reading, with an Early English church (restored); other places of worship; a town-hall, a market-house, a police-station, and a reading-room, contained in one building; alms-houses; a hospital; &c. It gives name to one of the parliamentary divisions of the county. Pop. in 1891, 3254; in 1901, 3551.

WOLCOT, JOHN, poet and satirist, better known as *Peter Pindar*, was born at Dodbrooke, in Devonshire, in 1738, being the son of a surgeon. He was educated at Kingsbridge, Liskeard, and Bodmin, and after spending a year in France went to London to study medicine. He was assistant to an uncle at Fowey from 1764 to 1767, and in the latter year he obtained the degree of M.D. from Aberdeen. In 1767 he accompanied Sir William Trelawny to Jamaica in the capacity of physician, and after he had returned to England in 1769 and taken orders in the church he obtained a living in the island. In 1770 he became physician-general to the troops of Jamaica, but in 1773, after governor Trelawny's death, he returned to England. He practised for a time in Cornwall and Devonshire, and in 1781 he removed to London along with Opie the painter, with whom he soon afterwards quarrelled. He first made himself known in the rôle of satirist in 1782, when he published his *Lyric Odes* to the Royal Academicians by Peter Pindar, Esq., a distant relative of the poet of Thebes and Laureat to the Academy. In these verses he attacked most of the academicians, notably West, and in his next publication, the *Lousiad* (1785-95), he made the king the butt of his satire. He afterwards satirized many other persons in a coarse but not ineffective style; in William Gifford, however, he met with more than his match. He died in Somers Town (London) on Jan. 14, 1819, having been blind for several years. His body was buried in St. Paul's Church, Covent Garden. Among his other works are: *Bozzy and Piozzi*, or the British Biographers (1786); *Peter's Pension: a Solemn Epistle* (1788); *Lyric Odes to the Academicians and Subjects for Painters* (1789); *A Rowland for an Oliver* (1790); *Odes of Importance* (1792); *Pindariana* (1794); *Nil Admirari, or a Smile at a Bishop* (1799); *Out at Last, or the Fallen Minister* (1801); *The Horrors of Bribery* (1802); *Carlton House Fête, or the Disappointed Bard* (1811); and *The Regent and the King* (1814). Wolcot was a painter of some skill, and issued an edition of Pilkington's *Dictionary of Painters*.

WOLD, WELD, YELLOW WEED, or DYERS' WEED, a British and European plant of the order Resedaceæ, known to botanists as *Reseda luteola*, and belonging to the same genus as the mignonette. It has a straight stem from 1 to 3 feet high, simple, lanceolate leaves, and long racemes of small yellowish-white flowers. It was formerly cultivated widely both in this country and on the Continent for the sake of the yellow dyeing substance found in all parts of the plant, especially in the leaves, seeds, and upper parts of the stem; but it has been all but entirely superseded by flavin, quercitron, and coal-tar yellows. The seeds are sown in June, and the plants are plucked up in the following year and dried for use. The colouring matter may be extracted with alcohol, but before use it must be submitted to some process of purification. When used with aluminium and tin mordants wold produces a fine lemon-yellow colour, but with chromium and iron mordants the colours produced are yellowish

and greenish olive. The lemon-yellow produced by weld with an aluminium mordant is still used for military uniforms in Britain.

WOLF (see Plate II. at CARNIVORA), a species of Carnivorous Mammalia, belonging to the family Canidae, or that also including the Dogs and Jackals (which see). The Wolves agree with Dogs in their dentition and most other respects, having six incisor teeth, two canines, eight præmolars, and four molars in each jaw. The pupil of the eye is round, and the tail of moderate size and covered with short hair. The Common Wolf (*Canis lupus*) of Europe and North Asia was formerly common in Britain. It has, however, been extinct for many years, and its remains are known to occur in recent British deposits. Probably the extinct *C. spelæus* was a wolf. The colour of the wolf is a general gray, whilst the younger wolves have a fawn tint in addition. The under parts are white, and the inner aspects of the legs gray—hence the Norwegian name of 'Graabeen,' or 'Gray-legs,' given to the wolf. The line of the spine is marked by a line of black hairs. The average size is that of a large dog. These animals are usually of a cowardly disposition, but become both bold and ravenous when pressed by hunger. They will not disdain to eat frogs, mice, and even insects under the latter stimulus, and they appear to attack and devour their sickly neighbours. They attack their prey by a series of short snapping bites. Their entire organization betokens immense endurance and strength. The Black Wolf (*C. occidentalis*) of the New World is a larger and finer animal than his European neighbour. Its fur is of a black colour, and in several minor points of its organization it differs markedly from the preceding species. The Prairie Wolf (*C. latrans*) occurs on the American prairies, and is of smaller size than the Black or Common Wolf. The Prairie Wolves are harmless enough when not pressed by hunger, but in packs contrive to hunt down and destroy large numbers of buffaloes. Another species, occasionally known as the American Wolf, is the Coyote or Cajote (*C. ochropus*), which is rather more fox-like in aspect than its neighbours, but is essentially wolf-like in all its habits.

The Aard Wolf (*Proteles cristatus*, also shown on Plate II.) belongs to the Carnivorous family Hyænidæ, and is regarded as uniting the Hyænas with the Dogs. Its name in Dutch means 'Earth Wolf', and has been given from its habit of burrowing in the ground. It is found in South Africa, and is coloured gray, with a yellowish tinge. Its length is about 3½ feet. The ears are prominent, and the tail very long and bushy, whilst the shoulders and neck possess a mane. The back and hind limbs are sloping, as in the Hyænas. The food consists of carrion and of the smaller animals.

The name Tasmanian or Pouched Wolf is given to the *Thylacinus cynocephalus* of Tasmania, illustrated in the plate at MARSUPIALIA, an animal belonging to the Marsupialia. This creature resembles a large dog, and is coloured of a yellowish-gray, with black bands on the hinder part of the back, giving it a striped or zebra-like appearance. It commits much havoc among sheep, but has now been well-nigh exterminated by the colonists.

WOLF, CHRISTIAN, BARON VON, a distinguished German mathematician and philosopher, born at Breslau on January 24, 1679; died at Halle on May 9, 1754. In 1707 he was appointed professor of mathematics and natural philosophy at Halle; but in 1723, being denounced as an infidel and a foe to religion, was deposed from his office, and banished from Prussia by Frederick William I. Thereupon he retired to Marburg, where he taught

till 1740, when Frederick the Great, son of Frederick William, ascended the throne, and recalled him to Halle, observing that in his kingdom everybody might be saved after his own fashion. In 1741 he was appointed vice-chancellor, and in 1743 chancellor, of the University of Halle; and the latter office he retained till his death. The mathematical works of Wolf were all published in the first part of his career and the philosophical ones in the second part, the latter chiefly at Marburg. In these works he popularized the principles of the system of Leibnitz, and he was the first to use the German language in treating such subjects. Wolf's version of the Leibnitzian system is taken by Kant as the typical example of dogmatic philosophy which his Kritik was intended to overthrow. His principal philosophical work is his *Philosophia rationalis, sive Logica methodo scientifica pertractata*. See Christian Wolf's *eigene Lebensbeschreibung*, edited by Wuttke (Leipzig, 1841).

WOLF, FRIEDRICH AUGUST, the greatest philologist of his age, was born at Haynrode, a village near Nordhausen, in Thuringia, on February 15, 1759. He early acquired a taste for the study of languages. Before entering the University of Göttingen in 1777 he had made himself acquainted, partially at least, with the principal classic authors, and those of France, Spain, Italy, and England. At the University of Göttingen he determined to devote himself to the study of philology exclusively; but he gave instruction to some of his fellow-students in Greek and English. For the use of those learning English he published in 1778 an edition of Shakspeare's *Macbeth*, with explanatory notes. Before he left Göttingen, in 1779, he laid before Heyne his views respecting Homer, which differed from those of the distinguished professor, and were peremptorily rejected by him. In the same year he went as teacher-extraordinary to the academy at Ilfeld, where he made himself known to the philological world by his edition of Plato's *Banquet*, with notes in German. In 1782 he was made rector of the town school at Osterode, and in 1783 accepted the offer of the professorship of philosophy and the science of education at Halle. As an academic teacher Wolf followed his own peculiar views: he believed that classical antiquity must be considered as a model of public and private life, founded on the noblest ideas, and be treated in this light as a means of forming the minds of pupils at the universities. His uncommon activity is shown by the fact that during the twenty-three years of his residence at Halle he delivered above fifty courses of lectures, all replete with the traces of a genius of the highest order, in addition to his lectures and labours at the philological seminary. In 1792 appeared his edition of Demosthenes' *Speech against Leptines*, which added much to his reputation as a philologist on account of its perfect Latinity and the masterly character of its introduction, commentary, and corrections of the text. In 1795 followed the first volume of his *Prolegomena ad Homerum*, in which he stated his views regarding the original form of the Homeric poems, endeavouring, with rare sagacity and erudition, to show that the *Odyssey* and *Iliad* in their present form are not the work of Homer but of several rhapsodists. (See HOMER.) The work attracted great attention all over Europe, gave rise to many controversies, and to the most important historical and critical inquiries. The author had no objection to controversy if truth was thereby elicited, but was offended with the assertions of certain scholars, among them even Heyne, that they had long entertained similar ideas. This caused the spirited *Briefe an Heyne* (*Letters to Heyne*), of which the first three are considered as excellent models of learned controversy and polished irony.

On the abolition of the University of Halle in 1806 he was deprived for a time of his only source of income; but in 1807 he went to Berlin, and became member of the department for public instruction in the ministry of the interior, professor in the new university, which he helped to found, and member of the Academy of Sciences. But he soon resigned his administrative and professorial duties, reserving only the right to lecture, according to his pleasure, in the University of Berlin. To the leisure which he now enjoyed we owe his incomparable *Darstellung der Alterthumswissenschaft* and the translations from Horace, Homer, and Aristophanes, which are as spirited as skilful. His *Analecta*, a literary periodical that appeared between 1817 and 1820, he suddenly discontinued, and from that time published nothing more, being indignant at the censorship which had been established. In April, 1824, he set out on a visit to the south of France for the benefit of his health. In July, 1824, he arrived at Marseilles, where he died on the 8th of August. Wolf formed numerous disciples, animated with the independent spirit of their great master. See Hanhart's *Erinnerungen an Fried. Aug. Wolf* (1825); Körte's *Leben und Studien Fried. Aug. Wolf's des Philologen* (1833); Arnoldt's *Wolf in seinem Verhältnisse zum Schulwesen und zur Pädagogik* (1861-62); and Volkmann's *Geschichte und Kritik der Wolf'schen Prolegomena zu Homer* (1874).

**WOLFE, CHARLES**, a young Irish divine of great poetical talent and promise, was born at Blackhall, Kildare, Dec. 14, 1791. He was educated at Bath, the Abbey School, Winchester, and Trinity College, Dublin. Having taken orders he obtained in succession curacies in the counties Tyrone and Down; but his health soon gave way, and he died at Cove of Cork (Queenstown) of consumption on Feb. 21, 1823. The composition which has given him considerable posthumous celebrity is his *Ode on the Death of Sir John Moore*, commencing

'Not a drum was heard,'

which Lord Byron pronounced 'the most perfect ode in the language.' Besides this piece, which first appeared anonymously in an Irish newspaper, he was the author of several minor poems of great beauty. His *Remains* were published at Dublin (two vols. 1825), with a notice of his life.

**WOLFE, JAMES**, a distinguished English general, was the son of Lieutenant-colonel (afterwards General) Edward Wolfe, and was born at Westerham, in the county of Kent, January 2, 1727. He applied himself early to the profession of arms, in 1742 was gazetted ensign in the 12th Regiment of Foot, and almost immediately after proceeded with his regiment to the Low Countries. He was appointed adjutant at the age of sixteen, and as such took part in the battle of Dettingen, in which he had a horse shot under him. In 1744 he was appointed captain in the 4th Regiment of Foot. Next year took place the battle of Fontenoy, in which Wolfe did not take part, being then with his regiment at Ghent. He returned to England with the rank of brigade-major, and took part in the suppression of the Scotch rebellion, being present at the battles of Falkirk and Culoden. In 1748 he was again on the Continent, and received a wound at the battle of Lauffeldt. Subsequently we find him quartered for some time in Scotland, in 1757 taking part in the abortive expedition to Rochefort, and in 1758 under General Amherst, and now with the rank of brigadier-general rendering important services in America at the taking of Louisburg. At length he was called into high and independent command by the elder Pitt, who appointed him to the charge of the important expedition against

Quebec, promoting him at the same time to the rank of major-general. Here he, singly and alone in opinion, formed that great, hazardous, but necessary plan of operation which drew out the French to their defeat and insured the conquest of Canada. Having surmounted all obstacles he encountered the enemy on the heights of Abraham, where, in the moment of victory, he received a ball in the wrist and another in the body, which rendered it necessary to bear him off to a small distance in the rear. There, roused from fainting in the agonies of death by the sound of 'They run,' he eagerly asked, 'Who run?' and being told the French, and that they were defeated, he exclaimed, 'Then I thank God, and die contented,' and after giving some directions relating to the cutting off of the enemy's retreat he expired. This event took place September 13, 1759, in the thirty-fourth year of his age. A national monument is erected to the memory of this officer in Westminster Abbey. West's picture of the Death of Wolfe has become generally known by Woollett's admirable engraving. In 1827 an obelisk was erected by the Earl of Dalhousie on the field of battle to the memory both of Wolfe and the Marquis of Montcalm, the commander of the French, who was mortally wounded in the same battle. The *Life of Major-general James Wolfe*, by Robert Wright, was published in London in 1864, and contains many of his letters.

**WOLFENBÜTTEL**, a town in Brunswick, on the Oker, 9 miles south of Brunswick. It has a castle, town-house, barracks, a library of about 300,000 volumes, besides MSS., including Luther's Bible, with his MS. notes; a statue of Lessing, who was long librarian to the duke; a gymnasium, a theological seminary; manufactures of linen, machinery, copper-ware, preserves, leather, and tobacco; and a trade in yarn, grain, and cattle. Wolfenbüttel was till 1754 the residence of the dukes of Brunswick, and once gave its name to a principality. It still gives its name to a circle or administrative division of the Duchy of Brunswick, with an area of 295 square miles. Pop. of town in 1895, 15,505; in 1900, 17,873.

**WOLFFIAN BODIES**, or **PRIMORDIAL KIDNEYS**, two bodies developed in man about the third week of intra-uterine life, and each existing as a hollow organ on either side of the primitive spine. Each wolffian body extends from the heart to the lower end of the body, and ends above in a pouch-like extremity, whilst it opens below into the urinary bladder. In structure each wolffian body resembles the permanent kidney (which see). It is attached above to the diaphragm or midriff by a ligament, and also to the spine below. These bodies act as kidneys in the embryo, and serve to secrete nitrogenous waste matters and urea from the blood. When the kidneys are developed in man the wolffian bodies in greater part disappear, whilst the remnant goes to form part of the internal generative organs.

**WOLF-FISH**, or **SEA-WOLF**. See **SEA-WOLF**.

**WOLF-MOTH** (*Tinea gravella*), a species of moth belonging to the same genus as the Clothes-moth (*T. Sarcitella*). This moth inhabits granaries, the larvae feeding on the grains of wheat and corn, and fastening them together by a silky secretion.

**WOLFRAM**, an ore of TUNGSTEN (which see).

**WOLFRAM VON ESCHENBACH**. See **ESCHENBACH** and **WARTBURG**.

**WOLF-SPIDERS**, Arachnidans belonging to the genus *Lycosa*, and represented by the species *L. tarantula*, *L. saccata*, &c. See **SPIDER**.

**WOLLASTON, WILLIAM HYDE**, chemist, was a son of the Rev. Francis Wollaston of East Dereham, Norfolk, born August 6, 1766; died December 22, 1828. Having received his academical education at

Cambridge he proceeded M.D. in 1793, and attempted to practise as a physician at Bury St. Edmunds, but with so little success that he removed to London. Soon after his arrival in that city he became candidate for the place of physician to St. George's Hospital, but, failing in his attempt, he declared his determination never again to write a prescription, and turned his whole attention to the cultivation of natural science. Though almost every branch of science at different times occupied his attention, chemistry was that to which he seems to have been most ardently devoted; and it was by his investigations in that department of knowledge that he attained the most distinguished reputation. He was accustomed to pursue his chemical examinations on the smallest specimens of the substance which he was analyzing; and he invented an ingenious method of determining the properties and constituents of very minute quantities of matter. He was endowed with bodily senses of extraordinary acuteness as well as with great general vigour of understanding, and had acquired a powerful command over his attention, and habituated himself to the most rigid correctness of thought and language. Among his inventions are his sliding rule or scale of chemical equivalents (see EQUIVALENTS); the goniometer or instrument for measuring the angles of crystals; the camera lucida; &c.: and we are indebted to him for the discovery of two new metals, palladium and rhodium, and of the malleability of platinum. Dr. Wolaston was the author of a great number of communications to the Transactions of the Royal Society, of which he was a member, and of several articles in Dr. Thomson's Annals of Philosophy, and other periodical works. He was elected a fellow of the Royal Society in 1793, and secretary in 1804.

WOLSEY, THOMAS, cardinal, an eminent minister of state under Henry VIII., is said to have been the son of a butcher at Ipswich, where he was born about 1474. While a mere boy he was sent to Magdalen College, Oxford, of which he became a bachelor at the age of fifteen, and was elected fellow. Being appointed master of a grammar-school dependent on the college, he had three sons of the Marquis of Dorset under his care, which led that nobleman to present him to the living of Limington, in Somersetshire. He afterwards acted as chaplain to the Archbishop of Canterbury, and then to one of the governors of Calais, who appointed him his deputy; and finally was recommended to Henry VII., who made him one of his own chaplains. Under Henry VIII. his progress in advancement was very rapid. In 1509 he was made Dean of Lincoln; in 1510 he became rector of Torrington; in 1511, canon of Windsor, registrar of the order of the Garter, and privy councillor; in 1513, dean of York and Bishop of Tournay (being then in France); in 1514, Bishop of Lincoln and then Archbishop of York. These are only a few of the offices and dignities that were showered on him. In 1515 the pope, to ingratiate himself with Henry, elevated him to the dignity of cardinal, and in the end of the same year Henry made him lord-chancellor. His nomination in 1518 to be the pope's legate *a latere* completed his ecclesiastical dignities, by exalting him above the Archbishop of Canterbury. At the time when the celebrated rivalry between the Emperor Charles V. and Francis I. rendered the friendship of Henry of great importance Wolsey was treated with the greatest respect by both sovereigns, receiving pensions from each, as well as a third from the pope. He ultimately, however, favoured the side of Charles, who settled upon him the revenues of two bishoprics in Spain, and flattered him with hopes of the Papal chair, which induced him to involve Henry in a war with France. Insatiable in the pursuit of

ecclesiastical emolument, in 1519 he obtained the administration of the see of Bath and Wells, and the temporalities of the abbey of St. Albans. His revenues now nearly equalled those of the crown. Part of them he expended in pomp and ostentation, and part in laudable munificence for the advancement of learning. His love of splendour was signally displayed on the Field of the Cloth of Gold in June, 1520; his love of learning in his foundation of several lectures, as well as the college of Christ Church at Oxford, and of a collegiate school at Ipswich. He also built a palace for himself at Hampton Court, but this he in the end presented to the king. In 1522, on the death of Leo X., and again in 1523, on the death of Adrian VI., he was foiled in his attempts to secure his elevation to the papacy, and on both occasions he attributed his failure to Charles V., to whom he ever afterwards entertained a strong aversion. But his influence in England was still as great as ever. The critical affair of the divorce of Queen Catharine was one of the first steps to his fall. He along with Cardinal Campeggio was appointed to determine the legitimacy of Henry's marriage with her, and lost the favour of the king by exposing himself to the suspicion of causing delays in the settlement of the question. He fell still more into disfavour by advising the king against marrying Anne Boleyn, by which he of course also roused the hostility of Anne herself and her friends. Some of the leading nobles now thought that they had a good opportunity of contriving his ruin, and caused him to be accused of having in the exercise of his duties of Papal legate violated the statute of premunire (1529). He was convicted. The Dukes of Norfolk and Suffolk were sent to require the great seal from him, he was ordered to quit York Place, his palace in London, and retire to Esher, in the diocese of Winchester, and his lands, goods, and chattels were declared forfeited. Henry still assured him of his protection. Part of his revenues were restored to him, and he was even reinstated in the diocese of York. But Henry did not continue his protection long. Towards the close of the year 1530 he was arrested at his mansion of Cawood, in the diocese of York, whither he had retired, and was ordered to be conveyed to London on a charge of high treason. Indisposition of body, however, combining with mental distress, he was obliged to stop at Leicester, where he was honourably received at the abbey. His disorder (dysentery) increasing, a few days brought him to his end, on the twenty-ninth day of November, 1530. Shortly before his decease he exclaimed to the officer appointed to conduct him, 'Had I but served God as diligently as I have served my king, he would not have given me over in my gray hairs.' There has been considerable disposition in later writers to vindicate the character of this minister; and it must not be forgotten that, in the reign of Henry VIII., who had broken his heart; of Mary, the daughter of the much-injured Catharine; and of Elizabeth, whose mother (Anne Boleyn) was the chief instrument of his downfall, no justice could be expected to be rendered to the better traits of his mixed character. If he was loose in his morals, grasping in his ambition, and rapacious, he was liberal and even profuse towards his dependants, and in his patronage of letters. He was enlightened far beyond the period in which he lived, and not only by fostering learning, but by causing many reforms to be made in the church, he prepared the way for that more extensive, though imperfect measure of reformation which took place in England after his death. As a diplomatist it is difficult to say whether his abilities or industry were the most remarkable, and it is to him that England is indebted for the first

notion of a vigorous police, and for a regular system in the administration of justice. See Cavendish's *Life*, an original authority; Creighton's short biography (1888); Brewer's *Reign of Henry VIII.*; works in German by Dr. Busch and Dr. Ehse; and Dr. Gairdner's article in the *Dictionary of National Biography*.

**WOLVERENE.** See GLUTTON.

**WOLVERHAMPTON**, a municipal, parliamentary, and county borough of England, in Staffordshire, 14 miles W.N.W. of Birmingham. It is beautifully situated on the summit of an eminence commanding a picturesque view, is substantially but rather irregularly built, and during late years has made extraordinary progress. The more important edifices and objects of note are a number of churches, of which the principal is the collegiate church of St. Peter, a fine stately structure, with lofty embattled tower, and many features of great interest; several excellent Dissenting chapels, and a handsome Catholic chapel designed by Pugin; an exchange; a very capacious market-hall; a cattle-market; a free library; a church institute; a sixteenth-century grammar-school, re-organized and re-housed in new buildings in 1874; an art-gallery and museum, with school of art adjoining; a noble hospital; a town-hall; the agricultural hall; a very large and convenient orphanage; a post-office, erected in 1895; various charitable institutions; a union poorhouse; a cemetery; corporation baths; handsome public park; &c. Wolverhampton is situated in the heart of the great midland mining district, and has extensive beds of coal and ironstone in its vicinity, the working of which gives abundant occupation to large numbers of its population. The smelting of iron-ore, and its conversion into pig, railway, sheet, hoop, rod, and nail iron, boiler-plates, iron-castings, &c., constitute its staple manufacture and trade; but almost every article produced from steel, brass, and tin is made here to a greater or less extent. Among other articles may be enumerated hinges, latches, bolts, axes, spades and garden tools, vices, anvils, coffee and malt mills, fire-irons, grates, &c. It has from an early period obtained a high name for the skill and ingenuity displayed by its artisans in the manufacture of locks and keys. Papier-mâché and japanned and tin wares are very extensively made, as also tin-plate, enamelled culinary utensils, galvanized iron-ware, chemicals, varnishes, cycles, &c. Wolverhampton is now a great railway centre, having communication by the London and North-Western, the Great Western, the Midland, and other railways. The parliamentary borough forms three divisions, each sending a member to Parliament. Pop. in 1891, co. bor., 82,662; parl. bor., 174,365; in 1901, 94,179 and 192,740 respectively.

**WOMB.** See UTERUS.

**WOMBAT** (*Phascolumys ursinus*), a species of Marsupial, also known by the name 'Australian Badger'. It belongs to the section Rhizophaga or Root-eaters, and lives on roots and grasses. The wombat attains a length of from 2 to 3 feet, the muzzle being broad, and the colour gray, mottled with black and white. The feet are black. The body is heavy and the legs short, the feet being provided with very strong claws, used by the animal in digging. It is of nocturnal habits, passing the day in its burrow. The teeth number two incisors (no canines), two præmolars, and eight molars in each jaw. The incisors are like those of Rodentia (which see), and grow from permanent pulps, as also do the remaining teeth. The tail is short and rudimentary, and the fur is of a woolly character. There are other two species, *P. latifrons* and *P. Mitchellii*. See plate at MARSUPIALS.

**WOMEN'S RIGHTS MOVEMENT**, the movement for securing to women a free share along with men in all forms of public and private activity for which they are not inherently unfitted by nature. The essential element in the demand is freedom, the removal of traditional and arbitrary restrictions on feminine activity, in order that woman may discharge to the full that part in the evolution of the race which peculiarly belongs to her. The modern movement may be said to have been inaugurated in the period of the French Revolution by the appeals to natural law as the basis of social arrangements. Two notable works of this period dealing with this matter are worthy of mention, Condorcet's *Lettres d'un Bourgeois de Newhaven à un Citoyen de Virginie* (1787), and Mary Wollstonecraft's *Vindication of the Rights of Women* (1792). Economic and other changes of far-reaching influence contributed to advance the movement for the emancipation of women during the latter half of the nineteenth century. At present this movement presents the following main phases:—(1) female legislative suffrage, now secured in several states of the American Union, New Zealand, South Australia, Isle of Man, &c.; (2) female local suffrage, now secured in the United Kingdom, and to a greater or less extent in many other countries; (3) right of election to public bodies, granted in the United Kingdom as far as school boards, boards of guardians, and parish councils are concerned; (4) right of married women to own and control property separate from that of their husbands, recognized in the United Kingdom by the Married Women's Property Act of 1882; (5) right to enter professions long regarded as reserved to males alone, now generally conceded in the case of medicine, in the United States also to a large extent in the case of law; (6) extension of the number of general occupations open to women; (7) right to university and other higher education on the same terms as men, now universally recognized; (8) right to the control of her own person even in the married state. See Stuart Mill's *The Subjection of Women* (1861); Stanton, Anthony, and Gage's *History of Woman Suffrage* (three vols., 1881–88); Stanton's *The Woman Question in Europe* (1884); Bebel's *Woman in the Past, Present, and Future* (Eng. trans., 1885); Ostrogorski's *The Rights of Women* (trans. 1893); &c.

**WONDERS OF THE WORLD, SEVEN.** See SEVEN WONDERS.

**WOOD.** On the subject of wood in its various aspects see such articles as ARBORICULTURE, BOTANY, CARPENTRY, FUEL, STRENGTH OF MATERIALS, TIMBER, &c. Here woods are classed by properties and uses. The following are those most remarkable for—

*Elasticity.*—Ash, hazel, hickory, lancewood, snake-wood, yew.

*Elasticity and Toughness.*—Beech, elm, hornbeam, lignum vitæ, oak, walnut.

*Durability* (in dry situations).—Cedar, chestnut, oak, poplar, yellow pine.

*Colouring Matters.*—Red: brazil-wood, camwood, logwood, Nicaragua wood, sapan-wood. Green: green-ebony. Yellow: fustic.

*Scent.*—Camphor-wood, cedar, rosewood, sandal-wood, satin-wood, sassafras.

The following woods are chiefly used for—

*Building.*—Ship-building: elm, fir, larch, locust, oak, pine, teak, kauri. Wet constructions (as piles, &c.): alder, beech, elm, oak, plane, white cedar, karri, jarrah. House carpentry: ash, chestnut, cypress, fir, oak, pine, sycamore.

*Machinery and Millwork.*—Frames: ash, beech, birch, elm, mahogany, oak, pine. Rollers, &c.: box, lignum vitæ, mahogany, service-tree. Teeth of



wheels: crab-tree, hornbeam, locust, service-tree. Foundry patterns: alder, mahogany, pine.

**Furniture.**—Common: beech, birch, cedar, chestnut, cherry, pine. **Best:** Amboyna, black ebony, cedar, cherry, cypress, mahogany, maple, oak, rose-wood, sandal-wood, satin-wood, tulip-wood, walnut, zebra-wood. See the articles on the different woods.

**WOOD, ANTHONY**, an eminent English antiquary and biographer, born at Oxford in 1832, entered of Merton College, Oxford, in 1847. Having graduated M.A., he set himself to transcribe the monumental inscriptions and arms of the parishes of Oxford, and in 1860 obtained permission to consult the registers and other records of the university in the Schools' Tower. These researches, added to others in the Tower of London and the Cotton Library, produced the materials for his *History and Antiquities of the University of Oxford*. It was written in English; but as it was thought proper that it should appear in Latin for the information of foreigners, it was translated into that language under the inspection of Dr. Fell, and published at the Oxford press, under the title of *Historia et Antiquitates Universitatis Oxoniensis* (two vols., fol.). His *Survey of the Antiquities of the City of Oxford* was edited by Rev. A. Clark in 1889-99 (three vols.). In 1891-92 appeared his *Athenæ Oxonienses*, an account in English of the writers and bishops educated at Oxford from 1500 to 1890 (two vols.). For an imputation in this work affecting the character of the deceased Earl of Clarendon he was expelled from Oxford. He died in 1895. The English edition of his first work appeared as *History and Antiquities of the Colleges and Halls in the University of Oxford* (1786-90), and *History and Antiquities of the University of Oxford* (1792-96). The Oxford Historical Society published an edition of his autobiography and diaries by Rev. A. Clark in 1891-1901 (five vols.).

**WOODBINE.** See **HONEYSUCKLE**.

**WOODBIDGE**, a market-town and river port in the county of Suffolk, 77 miles N.E. from London, on the river Deben, on the slope of a hill, which commands a fine view down the river to its influx into the sea. It has two churches, the older a fine building in the perpendicular style with a noble tower, the other built in 1842, a fine specimen of the early English style. There are several other places of worship, a grammar-school, a mechanics' institution, custom-house, &c. There are corn-mills, maltings, rope-walks, ship-building yard, and other industrial establishments. The town carries on a considerable coasting trade. Pop. (1891), 4480; (1901), 4640.

**WOODCOCK** (*Scolopax rusticola*, shown at ORNITHOLOGY, Pl. V., a species of Wading Birds or Grallatores, belonging to the sub-family of Scolopacinae or Snipes, and to the genus *Scolopax* itself. In this genus narrow nostrils exist, and the third toe is long and elevated. The length of this bird, which arrives in England in October, and leaves again in March or April, is about 14 inches, and its usual weight from 13 to 15 oz. Its colour is a brown of various shades, of darkest hue on the back, whilst the tail is black above, tipped with gray. These birds generally fly in numbers, and appear abroad at dusk or in the early morning. The colour assimilates so well with the surroundings of these birds that they are frequently with difficulty to be discovered; and the clear eye of the bird becomes the clue to its hiding-place. This fact Butler has mentioned in his *Hudibras*, where he says that

'Fools are known by looking wise  
As men find woodcocks by their eyes.'

The nest is made of fern fronds, and the number of

eggs is four; the colour of the eggs being a dull white, with brown spots. The mother-bird exhibits much affection for her young, and may convey them away from a dangerous spot. The food consists of worms, which these birds procure by thrusting the bill into the earth. In their migratory flight the woodcocks are said to fly very high. See **SNIFE**.

**WOODCOCK-SHELL** (*Murex Etruscus*), a species of Gasteropodous Mollusca, belonging to the family Muricidae, and known as a familiar British mollusc. It is coloured a yellowish-brown, and attains a length of 1½ inch. The Thorny Woodcock or Venus-comb Shell (*M. tenuispina*) derives its names from the comb-like array of spines which fringe the elongated siphonal canal of the shell. This latter species occurs in the Indian Ocean.

**WOOD ENGRAVING.** A notice of wood engraving, historical and descriptive, having been already given in the general article **ENGRAVING**, and the manner of preparing engraved wood-blocks for the press described under **PRINTING**, it remains to supply here additional details relating to the practice of the art, and to note some of its capabilities and advantages, with special reference to book illustration.

Various kinds of wood, such as plane-tree, beech, mahogany, and pear-tree, were formerly much in use, and are still frequently employed in coarse work. There is, however, no wood equal to box for the purposes of engraving; and as it combines all the qualities necessary to admit of the most delicate execution it has long been exclusively used for the finer kinds of wood engravings. The best quality of wood is that produced by the slow growth of temperate climates. Upon a good piece of the small, close-grained English box the finest line can be preserved in unbroken smoothness; whereas the large, coarser-grained wood of Turkey or America is apt to crumble before the graver. All box-wood blocks exceeding 4 or 5 inches square are made up of two or more pieces, according to dimensions. These pieces are joined closely together by means of small bolts, with screws and nuts let in from behind, and can be readily separated and re-joined with great exactness. This admits of a division of labour when large blocks require to be speedily executed; as after the drawing is made upon the complete block it can be taken asunder, and such portions of the subject as are in some degree independent of each other engraved by different hands.

The tools of the wood-cutter consist exclusively of gravers, small gouges, and chisels. (See **ENGRAVING**.) The block is placed on a small circular leathern cushion filled with sand, which affords not only a firm rest to the smooth wood, but permits it to be freely turned in all directions. The graver is held and used in a manner peculiar to this branch of engraving. The butt of the handle rests against the palm of the hand, three of the fingers closing round it; while the thumb is projected forward upon the block, serving at once as a rest for the blade and a check to regulate the force in cutting, the motions of the tool being guided by the fore-finger. In this simple manner the wood engraver executes the minutest details of an architectural or figure subject, and the intricacies of a landscape foreground, as well as the fine gradations of the distance, or the long straight parallel lines forming a large flat sky tint.

When an engraved block is damaged, or a serious error made, the only remedy is to drill out the part to the depth of about half the thickness of the wood, and to insert a tight-fitting plug, tapered at bottom to insure its being driven home. The top of the plug is made level with the surface of the block, and the part re-drawn and engraved.

The comparative merits of wood and steel engraving have sometimes been made the subject of unprofitable discussion by writers, whose fanatical preference for the one or other of the assumed rival arts rendered them unfit to judge fairly of the capabilities of either. Though certain general characteristics are common to both, wood-engraving wantonly throws aside its real strength when it competes with the sister art by adopting its style. The most perfect wood imitation of a steel engraving is but a feeble performance when compared with the mellow richness of tone in a highly finished line print, or with the broad bold contrasts and sparkling sketchy effects drawing and engraving on wood are so well fitted to produce when put to their legitimate use. The special advantage, however, which wood engraving possesses over all other forms of graphic art is its applicability to the purposes of book illustration in the form of *text-cuts*—that is, cuts inserted and printed in the page of type. In the illustrated books of the fifteenth, sixteenth, and seventeenth centuries, one large wood-cut usually filled the top of the page, and in profusely illustrated folios was accompanied by smaller cuts in the middle or sides, and sometimes placed entirely round the page. But when wood engraving declined about the end of the seventeenth century, copper-plates, which hitherto had occupied separate pages, began to take the place of wood-cuts in the text. The cost of separate printing, however, and the difficulty of exact register in their combination, allowed of only one plate being placed in the page, either at the top, or in an awkwardly vacant space in the middle or bottom. This drawback, combined with the very limited number that could be printed from a copper-plate, proved an effectual bar to their continued use in this form; and books with good text illustrations became more and more rare, until the revival of wood engraving led to their reproduction in a higher state of perfection, and in ever-increasing numbers. The only modern instances of plates printed in the page of type are the exquisite illustrations of Rogers' poems, and one or two others of similar stamp published about 1830, when the establishment of steel engraving allowing of greatly increased numbers being printed from one plate, seemed to warrant the restoration of that form of book illustration. But the great cost of producing these works, contrasted with the cheapness, convenience, and increasing beauty of wood-cut illustrations, prevented their being followed by others.

The special advantages of wood engravings consist not only in their capability of being set and printed in the page, with the type arranged in any form round them, but also of their being stereotyped—or, as is more frequently the case, electrotyped—along with the page of type; while the wood-block, as well as the type, is preserved and available for repeated stereotypes or electrotypes. As formerly explained, an engraved wood-block differs from a steel plate in having the lines forming the figure or picture standing up in *relief* like type, so that they can consequently be inked and printed in the same manner, and simultaneously with the type. In the steel-plate, the lines being cut out below the surface, the process of inking is reversed. The lines are filled with ink by moving a dauber over the plate with a rocking motion, and the superfluous ink then removed by wiping the surface with cotton rags, and polishing it with the palm of the hand; the ink being pressed out of the lines upon the paper by means of a roller press. Plate-printing is thus obviously a much more tedious, and of course more expensive, process than letter-press printing, and they must be always separate operations; the friction in wiping

the plate must also wear down the surface, while the passage of the soft type inking roller over the wood-block or electrotype cast has little or no effect upon it. Hence the superiority of wood engraving as a means of illustration, irrespective even of its great convenience in the pages of a scientific or descriptive work. The number that can be printed from a good steel-plate rarely exceeds 15,000, while a large wood-block has been known to give near a quarter of a million of fair impressions without rendering it unavailable for further use.

WOODLICE, the name given to certain Crustaceans belonging to the order Isopoda (which see). These forms are also known under the name of SLATERS, and are described in the article of that name.

WOOD-OIL, the name given in commerce to a resinous juice which exudes from various trees of Eastern Asia, chiefly members of the order Dipteraceæ, and of the genus Dipterocarpus. It has a fine aromatic odour, and is used for a great variety of purposes; in medicine as a substitute for copaiba balsam; by sailors for paying the seams of a ship instead of tar; by painters as a varnish; also in the making of lithographic ink, &c. It is an excellent preservative of timber against the attacks of white-ants. The substance is strictly an oleo-resin, and is also known as gurun balsam.

WOODPECKER, the term applied collectively to numerous species of birds belonging to the order Scansores or Climbers, and to the family Picidæ. In this family the bill is long, straight, and pointed. The sub-family Picinæ includes the most typical forms, distinguished by the bill being truncated at its tip, and the sides of the upper bill ridged. In this sub-family is included the Great Spotted Woodpecker (*Picus major*), the genus *Picus*, to which it belongs, being distinguished by the bill being equal in height and breadth. The nostrils are hidden by bristles. The wings are short and pointed, and have their fourth quills longest. The tail is long and rounded. As in all Scansores, the toes are turned two in front and two backwards—a disposition which materially assists these birds in climbing. Another feature worthy of note is formed by the disposition of the tongue, which is exceedingly long, and through the arrangement of the hyoid bone is capable of being rapidly protruded to a very great extent. Furthermore, its sides and apex are armed with barbed horny filaments serving to impale the insect-prey. The salivary glands are largely developed, and secrete a glutinous substance, which aids the tongue in its work of capturing insects. These birds are continually hopping about the trunks and branches of trees; and appear to tap on the bark for the purpose of causing insects to emerge from concealment, when they are readily seized. The stiff feathers of the tail are used by them to assist them in maintaining their position on the trunks of trees. The Great Spotted Woodpecker is common in Britain. It is coloured black and white, with a scarlet crown. White spots are variously disposed on the black ground; and the throat and under parts are white. The females want the red crowns. The average length is 8 or 9 inches. The nests consist of holes in the trunks of trees enlarged by the bill. The eggs number five, and are of white colour. The Downy Woodpecker (*P. pubescens*) inhabits America, and is about 7 inches in length. The head is black and scarlet on its top, the back being black, and the belly white. The Ivory-billed Woodpecker (*Campephilus principalis*) of North America is a large bird of 20 inches long, with a long hard beak. The colour is black, glossed with green hues, and a scarlet crest is borne on the head. The bill

is beautifully white, and may measure 1 inch in breadth at its base. The female has no crest. The Green Woodpecker of Britain is included in the genus *Geococcyx* under the name of *G. viridis*. It is distinguished by the bill being keeled and curved, and its edges straight. It is of sharp and truncated form. The tarsi are short and the claws large. The plumage is a general green, with scarlet on the top of the head, a black beak, and yellow on the tail-coverts. The Great Black Woodpecker (*Dryocopus martius*), the Lesser Spotted Woodpecker (*Picus minor*), and the Northern Three-toed Woodpecker (*Picoides tridactylus*) are the remaining British species. (See ORNITHOLOGY, Pl. I., figures 19 and 20.) Other American species are represented by the Red-headed Woodpecker (*Melanerpes erythrocephalus*), common in the United States, and belonging to a genus distinguished by the elongated tail and by the long wings. The head and neck are scarlet, and the upper parts black; the breast and belly being white. This bird was formerly famed for its depredations in orchards and corn-fields. The Ground Woodpeckers (*Colaptes*) are represented by the *C. auratus* or 'Gold-winged' species of America, distinguished by its amber and black barred wings, their under surfaces being a golden yellow. The head is gray, and the belly yellowish-white. The average length is 12 inches.

WOOD-PIGEON. See PIGEON.

WOODS, LAKE OF THE. See LAKE OF THE WOODS.

WOODS AND FORESTS, COMMISSIONERS OF, a department of the public service to which the management of the crown lands is committed. It is under the control of the treasury, to which it transmits annual accounts of its receipts and expenditure. The office of public works and buildings was incorporated with the commission in 1832, but was again placed under separate management in 1851. The management of woods and forests is now regulated by 29 and 30 Victoria, cap. xlii., 6th August, 1866.

WOODSTOCK, a mun. borough of England, in Oxfordshire, 8 miles N.N.W. of Oxford, on the Glyme, with spacious streets, well-built houses, a church and other places of worship, a town-hall, a grammar-school, and manufactures of gloves. Near it is Blenheim Palace, residence of the Marlborough family (see BLENHEIM). Of the ancient royal palace near the town nothing now remains. This palace gave name to one of Sir Walter Scott's novels, and in it the princess Elizabeth was confined for a time in the reign of Mary. Prior to 1885 the borough (which included a large area) sent one member to Parliament; there is now a parl. div. of Woodstock. Pop. of the town in 1891, 1628; in 1901, 1684.

WOOL, a term used very indefinitely. It is applied both to the fine hair of animals, as sheep, rabbits, some species of goats, the vicuña, &c., and to fine vegetable fibres, as cotton. The wool of sheep, from the earliest periods, has been of primary importance, as forming the principal clothing material of mankind in temperate regions. (See SHEEP.) The distinction between wool and hair is not radical, the one being but a modification of the other. Wool is softer, more curled and twisted, and more flexible than hair, and possesses in a much greater degree the remarkable property of felting. Under the microscope a fibre of wool appears as a continuous stem with rings of minute serrations round it at small intervals, so that it appears as if a number of minute cups were set the one within the other with their mouths or saw-like edges pointing in the opposite direction from the root end of the hair. All kinds of hair present a similar structure, though in hair properly so called the serrated rings are less frequent in a given length, and less sharply defined.

The effect of these projections is familiarly illustrated by the ease with which the fibre can be drawn through the fingers from the root towards the point, and the resistance experienced when it is drawn in a contrary direction. Upon holding up to the light a lock of wool, or a single fibre, it is further observed that the fibres have all acquired in the course of their growth a form more or less twisted or spiral, like that of a cork-screw; and by the two characteristics thus discovered the felting and thread-forming qualities of wool, and the valuable applications growing out of them, are at once explained. The contorted form of the fibres disposes them to embrace, or interlace with, or to hook on to each other; and the serratures, when the fibres are brought close together, in felt, thread, or cloth, present that resistance to slipping or separation which is indispensable to the strength of the fabric. In fine Saxon wool 2720 of these imbrications are found to the inch, in the ordinary merino 2400, in the Australian merino 1920 to 2400, in South-down 2000 to 2080, in Leicester wool 1850 to 1860. Each fibre of wool grows from a follicle in the skin, in which are also minute glands, furnishing at the same time with the formation of the fibre, and throwing out along with it, a profuse secretion of an oily or fatty matter. Of the weight of wool, as existing on or removed from the sheep, this always forms a considerable and sometimes a very large proportion. It is commonly known as the 'yolk' of the wool or fleece. This substance is not strictly a grease or oil; substantially it is a soap with an excess of oil, and in warmish water it dissolves freely, and may be washed almost entirely out of the fleece. The coarsest wools rarely contain less than 20 per cent. weight of yolk; South-down averages 45 to 50 per cent., and in the finest merino and Saxon wools it ranges between 60 and 75 per cent. of the weight. Obvious uses of the yolk are to maintain the softness and pliancy of the fibres, and to prevent the wearing off of the scaly projections which would otherwise result from the friction of the fibres upon one another during the movements of the animal. The wool of the same animal differs much on the various parts of the body; that on the back, shoulders, and sides is the best. There are likewise great differences between the wool of different sheep, depending in general upon their descent, the crossing of breeds, climate, food, and manner of living; and among the individual animals of the same breed, upon age, sex, and outward circumstances. According to its quality the wool is divided into different sorts, which receive different names. A threefold classification into primes, seconds, and thirds is pretty general in Great Britain; but sometimes the wool of a single fleece is divided into as many as ten sorts, called prime, choice, super, head, downrights, seconds, fine abb, coarse abb, livery, short coarse, or breech wool. The operation of sorting requires great delicacy of touch and much practice, the sorter being guided by minute differences imperceptible to ordinary observers. Among the qualities which determine the value of wool, and so serve to regulate its classification, are the following: Capacity for felting, already mentioned, fineness, softness, pliancy and elasticity, soundness (strong uniformly throughout), length, and colour (pure white being the best). Fineness, of all the obvious qualities of wool, has ever been esteemed the most important. By means of the microscope Dr. Parry measured fibres of nineteen sorts of wool; the finest was that of a Spanish merino ewe, the mean diameter being  $\frac{1}{1775}$  of an inch; that of the fibre of the ram was  $\frac{1}{1733}$  inch; of a Rambouillet ewe  $\frac{1}{1717}$  inch; of a South-down  $\frac{1}{1717}$ ; and of a Wiltshire ewe  $\frac{1}{1717}$  inch. The average diameter of the coarsest combing wool

(that is long wool, of which stuffs and worsteds are made) was  $\frac{1}{16}$  inch. The Saxon merinos have long been considered the most valuable in point of fineness of fibre. The wool of the alpaca is superior to English sheep wool in length, softness, and pliability; the fleece is also heavier, averaging from 10 to 12 lbs., with a filament from 8 to 12 inches long, and very lustrous; it is hence applicable, when woven thin, to linings, &c., and such auxiliary purposes in men's clothing as silk has been hitherto used for. It has been made into fine cloth for coats. The wool of the llama is shorter, and more rough. Attempts were made by the Highland Society to naturalize the alpaca in Scotland, but failed.

*British Trade in Wool.*—The government records of a very early period show repeated acts or edicts ostensibly forbidding the exportation of wool from the kingdom to other countries of Europe, but which for some time in reality prepared the way for profitable licenses of such trade, or for special grants to individuals. In the thirteenth century a considerable wool traffic with Italy and the Low Countries had already grown up, its importance being intimated by such facts as that Edward I. was enabled to make a gift to John, duke of Brabant, his son-in-law, of £4000 out of the customs on wools. In the same century, in consequence of the difficulties attending the traffic, and growing out of both adverse laws and the frequent forcible seizures of wool by the barons, several guilds, or associations of the merchants for mutual protection, were formed, among these being the 'merchants of the steelyard' or 'easterlings,' the 'merchants of the staple,' and others. The first act intended to prohibit the exportation of British wool was that of Edward III. in 1337. The purpose of restrictive measures in the outset appears to have been twofold: to secure control of the trade, with revenue in some instances to the crown, and to encourage woollen manufactures in England. Still in 1364 the export amounted to 31,651½ sacks at £6 the sack. As the manufacture of wool grew in amount and importance, the interests of the manufacturers and of the staplers or exporters came more decidedly into conflict; and under the clamours of the former entire prohibition of the export of wool was finally enacted to be in force from the year 1660. This prohibition existed in law and unqualified until 1825. The most marked results of the law were considerably to lower for a long period the prices of wool, and to maintain an enormous smuggling trade. Until 1802 the importation of foreign wool into Great Britain was free, and the quantity was increasing, the total from 1791 to 1799 being 34,011,369 lbs., of which not less than 33,190,595 lbs. were Spanish. At the demand of the wool growers a duty of 5s. 3d. per cwt. was in 1802 laid on imported wool, and this was increased till in 1819 it had risen to 56s., or 6d. per pound, nearly 50 per cent. on a large proportion of the imported article. Subsequently the duty was reduced to 1d. per pound, then to  $\frac{1}{2}$ d., and in 1844 finally abolished. Since the beginning of the nineteenth century a great change and a remarkable development have taken place in the wool trade. Between 1800 and 1815 what foreign wool was wanted was chiefly imported from Spain. Germany afterwards began to take the first place, and although the quantity of German wool imported has declined, it still holds the highest place for quality. The greater part of the wool now brought into Great Britain comes from her Australian colonies (including New Zealand), and a considerable quantity comes from her possessions in South Africa and India. The total import of wool (sheep, lamb, and alpaca) from all countries in 1854 was 106,121,995 lbs. The total quantity of sheep, lamb, alpaca, vicuña, and

llama wool imported into the United Kingdom in 1901 was 692,374,281 lbs., of which 294,213,768 lbs. were re-exported, leaving 398,160,463 lbs. for home use. Of the total, 573,194,188 lbs. came from British possessions (473,881,653 lbs. from Australia and New Zealand). The total value of the imported wool was £21,764,218, of re-exports £10,710,885, of difference £11,053,333. In addition to the above, goats' wool or hair to the amount of 19,897,546 lbs. was imported in 1901, mainly from Cape Colony and Turkey; value, £1,309,050. The re-export of the latter was 616,693 lbs., valued at £34,927. British sheep and lambs' wool was exported in the same year to the amount of 20,205,000 lbs., valued at £513,568.

**WOOLLEN MANUFACTURE.** The use of wool as an article of clothing dates from the earliest times. The shearing of sheep appears to have been an old and established practice among the Syrians in the days of the patriarchs. (See Gen. xxi. 19; xxxviii. 12.) The mention of sheep-shearers in the latter passage seems to indicate the employment of men specially skilled in the operation. In Lev. xiii. mention is made of garments having 'the warp or woof of linen or of woollen,' perhaps the earliest allusion to the technical processes of weaving. These two materials appear to have been the staples of the primitive weavers of Syria, Palestine, Greece, Italy, and Spain. Attic wool was celebrated from an extremely early period, and at least down to the time of the Latin poet Laberius in the first century before the Christian era; and the woollen fabrics of both Greece and Italy attained special excellence. Besides the antiquity of the processes of weaving and spinning, it is certain also that in very early times the dyeing of threads for the loom was practised, and that the thistle or teasel was employed, as the latter is now, to comb out a nap on the woven fabric. Among the Greeks and early Romans not only weaving, but the whole process of preparing the yarn, was domestic; every establishment of any size, especially in the country, being provided with a loom, though the manufacture of cloths was also carried on by a special class of persons. At the time of the Macedonian conquest the natives of India wove shawl cloths of great beauty; to the Egyptians and to the Hindus the Greeks were probably indebted for most of their later processes of woollen manufacture, as still later were the Romans (by way of Southern Italy and Sicily), and the people of Spain and Byzantium to the Greeks. Woollen garments were generally worn by the Romans of both sexes at a very early period. To the Greek skill, transferred to the Byzantine colony, were added in time contributions from the arts of Persia, India, and China, and Constantinople became famous for textile products of all sorts then known, but in particular for the beauty and variety of its woollen fabrics. Some time after the establishment of the eastern empire the more improved processes of the textile art gradually found their way to Italy. The Roman manufactures, such as they may have been at the time of the irruptions of the northern barbarians, appear not to have died out; they continued also in the countries in which Roman colonies had been established. A fraternity engaged in cloth manufactures appears to have been formed in the tenth century in the Low Countries; the wool of the country was first used, and imports afterwards made, until this district furnished a considerable portion of the cloth demanded in Europe. Spain, however, already produced her own cloth, and in the thirteenth century the beauty of cloths made from her fine wools was already celebrated. Early in the same century some friars of St. Michael established a woollen manufactory in Florence, in

which processes were employed apparently superior to those previously in use; others of the like character soon sprang up at Rimini, Perugia, and elsewhere. Florence appears to have had at the time some 300 shops, producing annually 100,000 pieces of cloth, though these were of the coarser and cheaper sorts. Accounts some thirty years later speak of 200 shops as turning out 70,000 to 80,000 pieces, worth more than 1,200,000 golden florins, and hence it must be supposed of superior quality. Eventually the manufactures of wool became most largely established in Flanders, England, and France, the people of Flanders having in fact so far taken precedence in the perfecting of textile processes and products that the workmen became successively the instructors of the less skilled English and French clothiers, and in reality the founders of the improved manufactures now so important to the two last-named countries. There is little doubt that the making of woollen cloths was introduced into England by the Romans, but the woollen manufacture did not rise into importance as a national employment until much later. Scarlet cloths of England are mentioned in the chronicles of Orkney in the twelfth century, and under Henry I. a clothiers' guild (*gilda tellariorum*) was chartered, receiving exclusive privileges within the district of London, Southwark, and the parts adjacent. In the time of William the Conqueror many of the clothiers of the Netherlands, driven from the country by an inundation, came to England, and established their business in Carlisle, and in the western counties. Many illiberal laws were passed from time to time to regulate the woollen trade of England, and it appears that various practices of adulteration, as the use of 'flock powder,' were prevalent to an extent which says as little for the morals of our ancestors as similar usages of the present day do for our own. In the reign of Edward III. Flemish cloth-weavers came over to England on the invitation of the king, and notwithstanding opposition and differential taxation succeeded in establishing their trade. The company of drapers (cloth-workers) was incorporated in 1364 from a previously existing association, the cloth-sheers were incorporated in 1480, and were united with the fullers in 1528 as the association of cloth-workers. The tailors (now merchant tailors) were chartered in 1399. The worsted manufacture appears to have taken its name from the town of Worstead in Norfolkshire, one of its earliest seats in England. The woollen manufactures of England were for a considerable time confined to the coarser fabrics, finer cloths being imported from the Continent, particularly from Brabant. Numerous restrictions continued to press upon and retard the progress of the home trade, which they were designed to foster. In the early part of the eighteenth century Yorkshire began to assume an important position in woollen manufactures, and this county soon became the chief seat of both the English worsteds and woollens. The woollen manufactures have profited more slowly than the cotton from the introduction of machinery, owing to the greater difficulties of adaptation, but these difficulties have been gradually surmounted, and except in the price of raw material the one manufacture has now comparatively little advantage over the other. The district of Yorkshire (West Riding), which is the chief seat of the woollen manufacture, is about 40 miles long and 20 broad, and contains the towns of Leeds, Huddersfield, Halifax, Dewsbury, Bradford, and Wakefield, all of them great manufacturing centres. In the extent of its woollen manufactures Leeds is the first town in England. Its largest production is in the middle and lower qualities, and large quantities are sent to the foreign markets by the Leeds manufacturers. Huddersfield

and its neighbourhood stand next to Leeds. Here an immense quantity of fancy trousers, waist-coatings, &c., and broad and narrow cloths, are made. Flannels and baizes are largely manufactured at or near Halifax, and cloth for the army. Bradford has now taken the place which was formerly held by Norwich as the chief centre of the worsted manufacture. Blankets are largely made in the district between Leeds and Huddersfield; mixed or coloured cloths in the villages west of Leeds and Wakefield. Dewsbury is the chief seat of the shoddy trade. The west of England holds the next place to Yorkshire; its fine broadcloths are very celebrated. Stroud and its neighbourhood in Gloucestershire; Trowbridge, Bradford, Chippenham, &c., in Wiltshire; Taunton and Frome in Somersetshire, are the chief seats of the manufacture. Large quantities of flannels are made in Wales. Scotland, especially the south, is famous for the sort of cloth called tweeds, and considerable quantities of plaidings, tartans, flannels, blankets, carpets, and shawls are also made.

The *shoddy trade* is a recent branch of English industry, and in nature by no means so trivial as its singular name would imply. It is principally carried on at Dewsbury in Yorkshire. Shoddy cloth is made up, in whole or in part, of old wool; and instead of being thrown aside as of little or no account, old woollen rags are carefully collected, and again brought into play. At Dewsbury, after undergoing several processes, they are torn to pieces by machinery, and brought back to their first state of raw wool; and this wool being spun again (in some cases along with new staple), is once more made into cloth. Shoddy cloth had been known to the trade as a material for padding, &c., for several years before the public heard of it; but now blankets, carpets, table-covers, druggets (some of which are painted to imitate carpets), flushings, material for pilot and other rough coats; in short, a wide range of cheap woollen goods are either wholly or partly made of our old friend with a new face, shoddy! The clothing of the army, also, and much of that of the navy, is now made up of the same humble material, which takes a better dye for the purpose than coarse cloth of the old fabric. The beautiful table-covers we admire in our retail warehouses, with their manifold tasteful patterns, are all of shoddy; the patterns being printed with aquafortis, from designs drawn in London and Manchester, and cut on holly or other blocks at the seat of manufacture. Finally, large quantities of shoddy cloth are exported.

*Processes of Woollen Manufacture.*—If a piece of superfine broadcloth, as requiring in succession all the operations upon the wool, yarn, and fabric needful for woollens of any sort, be taken as the representative of the whole class, then the following are the processes through which, and in the order given, the materials are passed:—1, sorting the wool; 2, scouring; 3, washing; 4, drying; 5, dyeing (when dyed in the wool); 6, willing; 7, picking or teasing; 8, moating; 9, oiling; 10, scribbling; 11, plucking; 12, carding; 13, slubbing; 14, spinning; 15, reeling; 16, warping; 17, beaming; 18, singeing, sizing, and other preparations of the threads for, 19, weaving; 20, scouring; 21, dyeing (when dyed in the piece); 22, drying or tentering; 23, burling; 24, milling or falling; 25, scouring; 26, drying or tentering again; 27, raising, dressing, or teasing; 28, shearing; 29, bolting; 30, brushing; 31, picking; 32, drawing and marking; 33, pressing; 34, steaming; 35, folding or packing. Some of these processes have already been described (see CARDING, DYEING, FULLING, TEASING, WEAVING), and others are too simple to require any particular description. After sorting the several packs of wool are separately scoured, washed, and dried. The

scouring is effected by soaking the wool in stale urine or in an alkaline lye heated to 120°. If the cloth is not to be white it is either wool-dyed or piece-dyed. If the former, the dyeing follows directly on the scouring or washing. Common colours, as browns and olives, are dyed by the larger manufacturers; but the true colours, as blue, black, or green, and those of all cloths of the smaller manufactories, are left to the special dyers. The process of willying or twilling is analogous to that of batting or scutching in cotton manufacture; the object is to disentangle and open the locks and free them of sand or other loose impurities. One of the best forms of willy is that in which a hollow truncated cone, with four bars projected beyond, but running parallel to its surfaces, and armed with iron spikes, revolves 300 to 400 times per minute within an outer cylinder, armed in the inside with similar spikes. The wool fed to the smaller end of the cone by an endless apron travels in revolving, by virtue of centrifugal force, to the larger; and after being thus opened and beaten up, it escapes into a wire cylinder or receptacle provided with a fan, which blows away the disengaged dust, and finally lays the cleared wool upon another apron in a continuous sheet. Coarser wools for cloths are willed more than once, sometimes before dyeing, and again after oiling and scribbling. Some larger impurities, such as the willy does not remove, as burs, pitch, or dirt, are then picked out of the wool while spread upon a wire-screen by boys or women; this includes both the picking and moating, the persons engaged being called wool-moaters. The wool is then spread upon a floor, sprinkled with olive-oil, and well beaten with staves. It is thus prepared for the scribbling-machine, the purpose of which is further to open and cleanse the fibres. This process is really a coarser carding effected by passing the wool successively between several cylinders studded with rows of teeth or wires, and made to revolve rapidly. The wool is conveyed to the cylinders by an apron, and given forth at the last in a delicate sheet, which is wound on a revolving roller. This operation also may be repeated two or three times. From the carding-machine, through which the wool is afterwards passed, it is delivered in the form of slender cylinders or pipes called cardings. Slubbing, which is a preparatory spinning, is performed by the slubbing billy, and consists in drawing out and twisting the cardings to the state of a soft weak thread. This is effected by means of several spindles set nearly upright in a frame, and receiving a turning motion at the same time that the frame itself is made to recede (upon friction-wheels running on rails beneath it) from a roller facing the spindles, and from which roller a carding is fed by the machinery to each spindle at the rate required—the entire action being quite similar to that of Hargreaves' spinning-jenny. (See COTTON SPINNING.) The proper spinning consists in bringing the soft yarn thus furnished to the fineness and firmness requisite for weaving, and the machinery and operation are again quite similar to those employed in spinning cotton. After the preparation for, and the process of weaving, follows that of scouring the cloth in order to remove the oil, sizing, dust, &c., introduced into it purposely in the meantime. This is accomplished by beating the cloth with wooden mallets moved by machinery while it lies in a sort of inclined trough, soap and water being first allowed to flow upon it, and afterwards clear water. Piece-dyeing and washing may then follow, otherwise the cloth is next removed to the drying-room, or stretched in the open air by means of hooks upon rails or tenter-bars, and allowed to dry. Being removed when dry to a suitable room, the operation of burling follows, the burlers picking out of it irreg-

ular threads, hairs, and dirt, and the process of fulling then succeeds. After the cloth has been fulling one or more times as may be required, it is again subjected to scouring, fuller's earth being now usually added to the water, and after rinsing the cloth is again stretched on the tenters and dried. Teaseling and shearing are the next operations. The object of the former process is to raise a sufficient number of fibres upon the surface, and of the latter to cut these to the proper length to form the pile or nap of the finished cloth. (See TEASEL.) The shearing was formerly done by hand shears, but this process has been superseded by an ingenious machine. Superfine cloths are dressed and sheared several times in succession. The cloth is then 'boiled,' or wound on a cylinder and immersed in scalding water. Brushing is performed by a revolving cylinder studded with suitable brushes. Then follow picking to remove blemishes, marking, &c., and the cloth is ready for sale. Such is a general description of the nature and order of the operations required in converting wool in the fleece into marketable cloths, though some of the less essential of these may not enter into the preparation of all the species of woollen goods, and in particular instances other slight deviations from the usual order beside those already named may occur.

*Processes of Worsted Manufacture.*—The object in view in preparing the long wools for manufacture is not to produce that thorough interlacing of fibres which is completed in fulling, but rather to produce a simply spun and woven fabric. The chief preparation of the wool accordingly consists in obtaining the fibres in a straight and parallel condition; and this is effected by combing. The combing wools are themselves divided into the long and the short—the former, of lengths varying from 6 to 12 inches, being chiefly used for carpets and other coarser goods; the latter, of lengths from 4 to 7 inches, for hosiery, merino, &c. The principal processes are: 1, sorting; 2, scouring; 3, drying; 4, plucking; 5 (for certain fabrics only) carding; 6, combing; 7, breaking; 8, drawing; 9, roving; 10, spinning; 11, reeling; 12, weaving; 13, dyeing, &c. Plucking is performed by passing the wool through a machine in which spiked rollers beat up and separate the fibres. The combing of the wool is still performed by hand in some instances, though more often by machinery. Breaking, which is effected by the breaking frame, is intended to open out fibres that may have escaped the combs. In this the sliver or parcel of straightened wool is passed between rollers and acted on by the teeth of a sort of endless comb, the relative velocities of the two being so regulated that the sliver is extended as well as combed. It is then subjected to the action of a machine similar to the drawing-frame of the cotton manufacture, and is thus further extended and equalized. The sliver, now greatly reduced but as yet untwisted, is then brought to the roving machine, in which it is passed successively between two pairs of small rollers, the second pair moving the more rapidly so as to draw it out in length, while at the same time it is slightly twisted by a turning movement of the hollow bobbin or fly through which the thread is drawn. The spinning, which follows this process, is conducted in much the same way as in the case of cotton manufacture; and this, with the remaining operations to which the yarn and cloth are subjected, do not require especial mention.

*Statistics of Woollen Trade.*—The number of woollen factories in the United Kingdom in 1890 was 1793, of which 494 were for spinning, 124 for weaving, and 895 for both. The number of spindles was 3,407,002, and of power-looms 61,831. Of worsted factories there were in the same year 753,



and of shoddy factories 125, the number of spindles being respectively 3,072,250 and 95,095, and the number of power-loom 67,391 and 2284. The total number of persons employed in the three kinds of factories (woollen, worsted, shoddy) in 1898 was 114,054, 130,695, and 11,676 respectively, the number of males included in these being 53,015, 48,127, and 5065. The total value of woollen and worsted manufactures exported from the United Kingdom in 1901 was £19,476,015, as against £22,571,067 in 1897, £27,182,385 in 1871, and £12,158,710 in 1860. For 1901 the above value includes the following among other items:—woollen and worsted and other yarn, £5,238,647; heavy woollen tissues, £3,398,399; light woollen tissues, £1,800,675; worsteds, £5,845,996; besides damasks, tapestry, plushes, flannels, carpets, blankets, shawls, rugs, coverlets, hosiery, &c. The value of woollen yarn imported in 1901 was £2,204,072; of woollen manufactures, £9,690,330. Woollen yarn is imported chiefly from Belgium, Germany, and France; woollen cloths from Holland; woollen stuffs from France; carpets and rugs from Turkey and India. Worsted yarn is exported chiefly to Germany, Russia, France, Denmark, and Belgium; heavy broad woollen tissues to Belgium, Canada, Germany, Turkey, France, &c.; worsted stuffs to the United States, France, Canada, China, Holland, Australia, Belgium, India, &c.

**WOOLSACK**, the seat of the Lord-chancellor of England in his capacity of speaker of the House of Lords. It is what its name implies, a large square bag of wool, without back or arms, covered with red cloth. In front of the lord-chancellor lie the great seal and the mace. The judges of appeal are likewise seated on woolsacks. Woolsacks were introduced at a comparatively early period, and certainly before the reign of Queen Elizabeth.

**WOOLWICH**, a metropolitan and parl. bor. of England, in the ancient county of Kent, on the right bank of the Thames, 8 miles below London Bridge, on the South-Eastern and Chatham Railway. It extends 3 miles along the river, and reaches about half a mile back from it; there are many ancient, together with a number of handsome modern houses, an old church (restored 1894) with a square tower, other places of worship, a town-hall, and several charitable endowments. It owes its chief claims to notice to its arsenal, which occupies an area of above 350 acres, and is one of the most complete and magnificent establishments of the kind in the world. Here guns and ordnance of all kinds are manufactured for the British army and navy, as well as torpedoes, shot, shell, carriages, wagons, &c., and accordingly there are most extensive forges, foundries, and workshops of various kinds in which the newest types of machinery are employed; while immense quantities of warlike stores are kept in suitable magazines and storehouses. In the Rotunda there is a fine collection of arms and other interesting objects. A large garrison is stationed at Woolwich, which is the head-quarters of the royal artillery; and there are various barracks, a military and a naval hospital, &c. On the edge of Woolwich Common, a fine large open area, are the handsome buildings of the Royal Military Academy (see **MILITARY SCHOOLS**); and the Royal Ordnance College is also at Woolwich. At North Woolwich, on the opposite side of the river, to which runs a steam ferry, many houses and extensive factories, especially of telegraph cables, have recently sprung up. The parliamentary borough, created in 1885, includes the parishes of Woolwich, Eltham, and Plumstead, and sends one member to Parliament. Pop. of metropolitan borough in 1891, 98,994; in 1901, 117,165.

**WOORALI POISON.** See **CURARA**.

**WORCESTER**, an inland county of England, bounded on the north by Salop and Stafford, on the west by Hereford, on the south by Gloucester, and on the east by Warwick; with some separated portions, inclosed by the counties of Gloucester and Warwick. The area is 480,064 acres. The surface, generally level or gently undulating, has some extensive and beautiful vales, the principal of which, that of the Severn, is 30 miles long, and  $\frac{1}{4}$  mile to 1 mile broad. On the south-west are the fine eminences called the Malvern Hills, the loftiest of which is 1444 feet above sea-level. The strata consist for the most part of new red sandstone, lias, and oolite; other formations are visible in the chain of the Malvern Hills and some other districts. The soil, composed chiefly of clay and loam, is of great fertility. The principal crops are wheat, barley, oats, beans, pease, turnips, and hops. The orchards are celebrated for their apples and cider. The vales consist of meadows and rich pastures. The sheep are of the Leicester breed. The total area under grass and crops is about 400,000 acres, including some 78,000 under corn crops, mainly wheat, oats, and beans, some 28,000 under green crops, mainly turnips, potatoes, mangold, and vetches, about 28,000 under rotation grasses, and over 250,000 acres in permanent pastures. Rather less than 20,000 acres are occupied by woods and plantations. Coal is found in the north and north-west; the brine springs at Droitwich and Stoke Prior supply immense quantities of salt; iron is found with the coal, and the manufacture of iron and steel, and of hardware, is extensive; carpets and rugs are made at Kidderminster; and porcelain, gloves, and other articles at Worcester. Worcester is divided into five divisions, each of which sends a member to Parliament. The city of Worcester and the boroughs of Dudley and Kidderminster also send one member each. Pop. in 1891, 413,760; in 1901, 488,401.

**WORCESTER**, a mun., parl., and county borough of England, the see of a bishop, capital of Worcester-shire, situated in a beautiful vale on the eastern bank of the Severn, over which is a bridge of five arches, 103 miles N.W. from London. Being an ancient fortified place, this city had a strong wall, of which some remains may yet be seen. The cathedral is a noble specimen of Gothic simplicity. It was first erected by Ethelred, king of Mercia, in 680, and a later edifice was burned down and rebuilt in the beginning of the thirteenth century. It was restored in 1857-74. Its form is that of a double cross. It is in length 394 feet, in breadth 78, and in height 68; and the tower, which rises from the intersection of the nave and aisles to the altitude of 170 feet, is ornamented at the corners by lofty pinnacles. It contains many handsome monuments and sculptures. In the course of the restoration the west front was remodelled, and a reredos, memorial windows, new clock and peal of twelve bells were added to the structure. There are about twenty other handsome places of worship, such as Holy Trinity, St. Nicholas, St. Andrews, St. Helena, &c. Among other buildings are the shire-hall, guildhall, Victoria Institute (library, museum, &c.), corn-exchange, the hop and fruit market, museum of natural history, two grammar-schools, several charitable institutions, &c. It is the chief seat of the English leather glove trade, has celebrated porcelain-works, 'Worcester sauce' works, vinegar-works, chemical and manure works, foundries, railway-signal works, carriage-factories, and other works. Its trade in hops is extensive. There are municipal electric-lighting works, and a service of electric trams is to be introduced. The most remarkable event here was the famous battle between the English army, under

Cromwell, and the Scotch in the cause of Charles II., in 1651, the latter being completely routed—a result regarded by Cromwell as a 'crowning mercy'. It sends one member to Parliament. Pop. of county bor. in 1891, 42,908; in 1901, 46,623.

**WORCESTER**, a town of the United States, in Massachusetts, in a valley near the river Blackstone, on several lines of railway. It is considered one of the finest towns in New England, and has two spacious public parks, and several elegant streets, one of which, about 1½ mile long, is straight, broad, and shaded with beautiful trees. There are many fine public buildings, including the white marble city-hall (1898); the new post-office; the hall of the American Antiquarian Society, with a valuable library and museum; the art museum (1898); the state lunatic asylum; the Clark University (1887); the free library; high-school; a polytechnic institute; &c. The manufactures are very extensive and varied, the chief being iron, copper, and steel wire, machinery, envelopes, boots and shoes, organs, and pianos. Pop. (1890), 84,655; (1900), 118,421.

**WORCESTER**, EDWARD SOMESET, MARQUIS OF, an English nobleman celebrated for his scientific studies, and for his connection with the development of the steam-engine. He was born in 1601, and was engaged in the service of Charles I. during the civil war. He received great but secret powers from the king to act for him in Ireland; but, being a Roman Catholic, he had difficulties with the Protestants and was treated with duplicity by Charles, and latterly retired to France. He was imprisoned in the Tower from 1652–1654, and his estates were sequestered, but after the restoration he recovered most of these. He afterwards spent his time in retirement, and in the cultivation of natural philosophy and mechanics. In 1663 he published a book entitled *Century of the Names and Scantlings of Inventions*, in which he first gave a description of the uses and effects of an engine for 'driving up water by fire'; and he afterwards published a small pamphlet, called an *Exact and True Definition of the most Stupendous Water-commanding Engine*, invented by the Marquess of Worcester. In neither of these does he give any statement of the mode of constructing his engine; but, from his description and account of its effects, it may be inferred that its action depended on the condensation as well as the elastic force of the steam (see **STEAM-ENGINE**). He was looked upon by his contemporaries as a visionary speculator. He died in 1667. See *Dircks's Life* (1865).

**WORCESTER COLLEGE**, OXFORD, originally called Gloucester Hall, was founded in 1714 by Sir Thomas Cookes of Bentley, Worcestershire, for a provost, six fellows, and six scholars. Under the statutes of 1882 Worcester College consists of a provost, nine or ten fellows, and nineteen scholars. There are a number of exhibitions, two of which are connected with the Charterhouse School, and three with Bromsgrove School.

**WORD**, or **WATCHWORD**, in an army or garrison, is some peculiar word or sentence by which the soldiers know and distinguish one another in the night, &c., and by which spies and designing persons are discovered. It is used also to prevent surprises. The word is given out in an army every night.

**WORDSWORTH**, WILLIAM, one of the greatest of modern English poets, was born on 7th April, 1770, at Cockermouth, Cumberland, where his father was an attorney-at-law. He lost his parents at an early age, and after attending Hawkshead grammar-school he was sent in 1787 to St. John's College, Cambridge. Here he continued till 1791 and took the degree of B.A. During the vacations he made tours to various places to gratify his love of natural

scenery. In autumn, 1790, he made a pedestrian excursion through France and Switzerland in company with a fellow-collegian, to whom his first poem, descriptive of the scenes they had visited together, was addressed. The next year he again visited the Continent, and remained in France for fifteen months, residing partly at Paris, partly at Orleans, and partly at Blois. At this time Wordsworth was an ardent republican, and entered with such enthusiasm into the proceedings of the French revolution that he came to entertain the idea of getting himself naturalized as a French citizen, but was obliged to return to England in the end of 1792. From this period to 1795 he led a rather aimless and unsettled life, wandering about from place to place, and resolutely withstanding the recommendations of his friends that he should devote himself either to the church or the legal profession. In 1793 he published his *Descriptive Sketches*, a poem based on his Continental experiences, and in the same year *An Evening Walk*, dealing with the English lake scenery, both of which are deficient in animation, and failed to attract much attention. In 1795 a young friend of Wordsworth, Raisley Calvert, whom he had attended during a lingering illness, died, and bequeathed him a legacy of £900, which, with a further sum of £1800, paid him as his share of his father's estate, enabled the young poet to devote himself to the cultivation of his art. His sister Dorothy now came to live with him, and in 1795 they settled at Racedown Lodge, Dorsetshire, where, in 1797, they made the closer acquaintance of Coleridge. In order to be near him they removed to a mansion called Alfoxden, in the neighbourhood of Nether Stowey, Somersetshire, near which town Coleridge was then residing. The result of this step was a sort of literary copartnership, in virtue of which a collection of *Lyrical Ballads* appeared in 1798, containing the *Ancient Mariner* of Coleridge, and twenty-two pieces contributed by Wordsworth. In 1798–99 the two poets and Miss Wordsworth made a tour in Germany, and on their return Wordsworth and his sister took up their abode in a cottage at Grasmere, Westmorland. A new series of the *Lyrical Ballads* was published in 1800 in two volumes (with preface on poetic diction, and among new poems the splendid *Lines* written above Tintern Abbey); and two subsequent editions appeared respectively in 1802 and 1805. In 1802 Wordsworth married his former school-fellow Mary Hutchinson, with whom for nearly fifty years he enjoyed complete domestic happiness. His sister continued to reside with him and his wife, and in 1803 they made a tour in Scotland, and made the acquaintance of Sir Walter Scott. Dorothy Wordsworth's *Recollections of this tour* were published in 1874, edited by Principal Shairp of St. Andrews.

In 1807 Wordsworth published a new collection of pieces, entitled *Poems in Two Volumes*, containing some of his finest work, more especially the famous *Intimations of Immortality*; but the public were very slow in recognizing his merits as a poet. In 1808 he removed from Grasmere to Allan Bank, in the same neighbourhood, and in 1813 to Rydal Mount, where he continued to reside during the remainder of his life. In the year last mentioned he was appointed, through the influence of Lord Lonsdale, distributor of stamps for the county of Westmorland, an office which afforded him an income of £500 a year, and the duties of which were discharged by a deputy. About this time the lake district became the residence of several other poets, including Coleridge, Southey, and John Wilson. From this circumstance the scornful appellation of the 'Lake School of Poetry' and the 'Lakists' was

applied to them; but with the exception of Wordsworth, whose writings abound with local studies of scenery and life, the epithet, as a descriptive one, is wholly without meaning.

Wordsworth's longest poem, *The Excursion*, was first published in 1814. It contains a store of philosophical remarks, interspersed with most graphic and beautiful descriptions of the mountain country in which the scenes of the poem are laid. The reception of this poem was at first even more discouraging than had attended Wordsworth's previous productions. Jeffrey wrote a slashing article upon it in the *Edinburgh Review*, but in this, as in many other instances, the public verdict ultimately upset that of the reviewer. The *White Doe of Rylstone*, a beautiful poem on an incident connected with the Catholic rising in the north in Queen Elizabeth's reign, appeared in 1815; and in 1819 were published the tales of Peter Bell and *The Waggoner*, both admirably descriptive of rural scenery and unsophisticated human nature, but like his other poetry much decried and ridiculed by the critics of the day. In 1820 appeared *Sonnets on the River Duddon*, followed in 1822 by a collection of sonnets and other poems, under the title of *Memorials of a Tour on the Continent*, and several years afterwards by *Ecclesiastical Sonnets*. Much of Wordsworth's finest poetry is contained in his sonnets, a department in which very few have been successful. In 1835 appeared his *Yarrow Revisited*, and other Poems, the result of a tour in Scotland in 1833. A pension of £300 per annum was bestowed on him in 1842, and the following year, on the death of Southey, he became poet-laureate. In 1842 he published a tragedy entitled *The Borderers*, along with other poems. The death of his daughter Dora, which affected him much, occurred in 1847. He died 23rd of April, 1850. *The Prelude* appeared posthumously in this year, *The Recluse* not till 1888—both poems being connected in topic with *The Excursion*. Among prose writings Wordsworth was the author of a political pamphlet on the Convention of Cintra; an *Essay on Epitaphs*; and part of the text of a work entitled *Select Views in Cumberland, Westmoreland, and Lancashire*. Like those of his friends Coleridge and Southey, Wordsworth's political views altered as he grew older, and he settled down into a zealous conservative.

The poetry of Wordsworth belongs essentially to the contemplative school, and may be regarded as presenting a faithful reflex of the author's feelings, as called forth by the varied manifestations of nature in a lovely and secluded mountain district, combined with the different incidents and phases of rural life and character. The *Memoirs of Wordsworth* by his nephew, Bishop Wordsworth, were published in two volumes in 1851. The best editions of his poems are the one-volume edition by John Morley; the Aldine, in seven volumes, by Prof. Dowden; and Prof. Knight's library edition in eight volumes, with *Life*. His prose writings were collected and published in 1876 (three vols.) by A. B. Grosart.

WORK, the name given to a transmutation of energy. A unit of work may be taken as a weight of one pound lifted one foot. In performing a unit of work a definite amount of energy has been placed in the pound of matter, which it is capable of giving out again in falling the foot which it has been raised. A number which will represent the work will also measure the energy involved. The above unit of work is called a *foot-pound*. Sixty pounds raised 1 foot, or 1 lb. raised 60 feet, represents 60 ft.-lbs. In the C.G.S. system the unit of work is the *erg*, which is the work done against a force of one dyne through a distance of one centimetre. The corresponding British absolute unit is the *foot-poundal*.

WORKHOUSES were originally erected in the reign of Charles II. in order to compel rogues and vagabonds to work for a living. Act 9, George I. cap. vii. entitled the churchwardens or overseers of the poor, with consent of the majority of the inhabitants, to establish workhouses for lodging and maintaining the poor, and made various arrangements for union of parishes for this purpose. The abuse of the out-door system of relief (see POOR-LAWS) led to an extension of the workhouse mode of relief, provided for by 4 and 5 William IV. cap. lxxvi. Commissioners appointed by that act are empowered to cause workhouses to be built, altered, or enlarged, and to form by-laws for their government, to be enforced by the justices. Orders for admission to the workhouse are given by the board of guardians, overseers, or relieving officers, but in case of necessity admission must be given without an order. By 34 and 35 Victoria, cap. cviii. the guardians of every union are bound to provide casual wards, with such fittings as the poor-law board consider necessary, for the accommodation of the casual poor. Every workhouse has to keep a register of religious creeds, and also a register of persons under sixteen, hired out as servants or apprentices, whom the relieving officer must visit twice a year to inquire into their food and treatment. The inmates of workhouses are not allowed to go out and in at pleasure, and the able-bodied are compelled to work when required. In suitable situations they are often employed in field labour. Married persons are separated unless both are above sixty years of age. Drunkenness, misconduct, or refusal to work, exposes to the penalty of imprisonment with hard labour. The workhouses, after being under the control of the poor-law board, were placed under the local government board in 1891.

In Scotland the legal designation of houses provided for the accommodation of the poor is poorhouses. Act 8 and 9 Victoria, cap. lxxiii. provided for the extension and uniform management of the poorhouses of Scotland. They were placed under local boards and under the board of supervision in Edinburgh, by whom all plans for their erection and maintenance must be approved. The board issued a general code of regulations which was adopted with modifications suited to the particular case. The Scotch act gives the right of admission to the aged, friendless, and impotent poor, and the poor who are unable to take charge of their own affairs. The houses are now under the parish councils and the Scottish local government board.

WORKINGTON, a mun. borough and seaport of England, in the county of Cumberland, near the mouth of the Derwent, which enters the Solway Firth 33 miles from Carlisle. The town is of importance from its industrial establishments, which comprise large iron-smelting works and works for steel rails, iron plates, &c.; it has a ship-building yard and collieries, and carries on a considerable shipping trade. Pop. (1891), 23,522; (1901), 26,141.

WORKS AND PUBLIC BUILDINGS, BOARD OF, in Britain, a department of the public service under the control of the Treasury, having the charge of all public works and buildings undertaken or maintained at the expense of the revenues of the state. This department has also the management of the parks of the metropolis, and of the admission of the public to national collections or other public property, the care of public statues, and other duties. The board consists of the secretaries of state, and the president and vice-president of the board of trade, as *ex-officio* commissioners, and a first commissioner who has a seat in the cabinet.

WORKSHOP AND FACTORY REGULATION. The British law on this subject is now

contained in the consolidating Factory and Workshop Act of 1901 (1 Ed. VII. cap. xxii). A workshop is distinguished from a factory by the absence of steam, water, or other mechanical power; and factories are regarded as of two types, textile and non-textile. A textile factory is any place wherein mechanical power is used to work machinery used in the manufacture, or in any process incident to the manufacture, of cotton, wool, hair, silk, flax, hemp, jute, tow, china-grass, cocoa-nut fibre, or other like material. The non-textile factories which come under the act are enumerated in schedules. A child is defined to be a person under fourteen years of age, or one of the age of thirteen who has not obtained the educational certificate mentioned in Part III. of the act. Persons above the age of fourteen (or of thirteen if they have the requisite certificate) and under the age of eighteen are young persons, and females of eighteen years and upwards are women. The act consists of ten parts, comprising 163 clauses. The parts deal respectively with: (1) health and safety; (2) employment; (3) education of children; (4) dangerous and unhealthy industries; (5) special modifications and extensions; (6) home work; (7) particulars of work and wages; (8) administration; (9) legal proceedings; and (10) supplementary matters.

Under Part I. there must be 250 cubic feet (for overtime 400 cubic feet) for each employee in a room, and regulations are laid down as to temperature, ventilation, sanitary conveniences, and cleanliness. Dangerous machinery must be securely fenced. There are regulations as to means of escape from fire in factories and workshops employing over forty persons. Clauses 23-33, in Part II., regulate the hours of labour, meal-times, &c., of women, young persons, and children. Children can only be employed on the system of morning and afternoon sets, or on alternate days. In the first case, the morning set begins at 6 or 7 a.m. (or 8 a.m. in non-textile factories and workshops) and ends at 1 p.m., or at the beginning of dinner-time if before 1 p.m., or at noon if dinner-time does not begin before 2 p.m. The afternoon set begins when the morning set leaves off (after dinner-time in the second of the three cases just mentioned), and stops work at 6 or 7 p.m. (or 8 p.m.). A child must not be employed in successive weeks in the same set. In the alternate-day system the hours are the same as for young persons, but with two hours for meal-times; and a child must not work on two successive days, or on the same days of two successive weeks. In textile factories, print, bleaching, and dyeing works the hours for children on Saturdays are the same as for young persons, but no child can be employed on two successive Saturdays, or on the Saturday of any week in which the period has exceeded  $5\frac{1}{2}$  hours on any day. In non-textile factories and workshops the Saturday hours for children on the alternate-day system are the same as for young persons; if employed in the afternoon set, work ends at 2 p.m. Women and young persons may be employed on mid-week days from 6 a.m. to 6 p.m. or 7 a.m. to 7 p.m. (or 8 a.m. to 8 p.m. in non-textile factories and workshops, except print, bleaching, and dyeing works), the daily meal-times being for textile factories 2 hours, and for non-textile factories and workshops  $1\frac{1}{2}$  hour. On Saturdays the meal-time is half an hour, and in non-textile factories and workshops the hours are 6 to 2, or 7 to 3, or 8 to 4, with some modifications. In textile factories where work begins at 6 a.m. employment on manufacturing processes must cease at noon, if one hour be allowed for meals; if less than one hour is allowed for meals the Saturday hours are 6 to 11.30 for

manufacturing processes. If work begins at 7 a.m. the closing time for manufacturing processes is 12.30. The minimum age for employment in a factory or workshop is now twelve years, and no woman, young person, or child can be employed continuously for more than  $4\frac{1}{2}$  hours in a textile factory, or 5 hours in a non-textile factory or workshop, or a print, bleaching, or dyeing establishment, without at least half an hour's meal interval. Overtime and night-work are regulated, and certain exemptions may be granted under specified circumstances.

In Part III. of the act it is enacted that a child employed in a factory or workshop must attend an efficient school, making one attendance per day when on the set system, and two attendances for each work-day before a day of employment when on the alternate-day system. Clauses 73-78 contain provisions regarding factories where unhealthy occupations are carried on, especially in regard to the employment of women and children; and clauses 79-86 deal with dangerous trades. Clauses 87-89 (Part V.) deal with tenement factories, i.e. factories in which mechanical power is supplied from a common source to various manufacturing processes carried on in the same building by different persons. Clauses 90-96 regulate factories in which atmospheric humidity is produced artificially; clauses 97-102 deal with bakehouses; clause 103 fixes the periods and conditions of employment in laundries carried on for trade or gain; clause 104 extends the provisions regarding accidents, dangerous machines, &c., to docks, wharfs, quays, warehouses, &c.; clause 105 extends the same provisions to buildings in the construction of which machinery is temporarily used; and clause 106 extends them to railway lines and sidings used in connection with a factory or workshop. Part VI. attempts to regulate the conditions of work in domestic factories and workshops, and especially to prevent infection being spread by means of wearing apparel made under insanitary conditions. The administration is mainly in the hands of factory inspectors, of whom a few are women, acting under the authority of the Home Office, but local authorities are responsible in certain cases. For a history of factory legislation see FACTORY ACTS.

**WORKSOP**, a market-town of England, in Nottinghamshire, 26 miles north of Nottingham, in a well-wooded and picturesque district, near the north extremity of Sherwood Forest. It has a beautiful Norman church, part of which belonged to an Augustine priory. There is a considerable trade in malt and timber, and there are collieries in the neighbourhood. Pop. (1891), 12,734; (1901), 16,112.

**WORMS**, a town of Germany, in the Grand-duchy of Hesse, on the left bank of the Rhine, here crossed by a new bridge, 28 miles S.S.E. of Mainz. It still retains portions of its old walls and massive towers. The principal public building is the cathedral, a large and interesting structure in the Romanesque style. There are other interesting churches, and a fine monument to Luther (1868) embracing altogether twelve statues. The building in which Luther made his noble stand at the diet of 1521 no longer exists. Worms has long lost the importance which it had when it was a free imperial city. Pop. in 1900, 40,705.

**WORMS**, a general name used in zoology as applying only to the Annelida or True Worms, belonging to the Annulosa or Articulata, and represented by the Leeches (*Suctorina*), Earthworms (*Oligochæta*), Tube-worms (*Tubicola*), and Marine-worms generally (*Eunice*, *Nereis*, &c.), or *Errantia*. The Spoon-worms (*Gephyrea*) may also be included with the

**true worms.** Many animals named worms in a popular sense (such as Tapeworms, which see) are not true worms at all, but are so termed from possessing elongated bodies. Whilst such forms as Round-worms (see NEMATHELMIA), Thread-worms, and the like, are not included in the Annelida, but with the Tape-worms in the *Scolecida* (which see).

**WORMS, INTESTINAL.** The worms which are most frequently found in the human intestines are of three different kinds:—1st, *Ascarides*, small white worms like threads, from  $\frac{1}{2}$  to  $\frac{1}{4}$  inch in length. They generally lodge in the mucus contained in the lower part of the rectum, where they cause great itching. 2d, *Lumbrici*, long round worms, somewhat like the common earth-worm. They are sometimes found in considerable number. 3d, *Tenia* or tapeworm. They consist of sections joined together by articulations, often extend to a great length, and are narrower at the extremities than in the centre. Some have been known to measure between 30 and 40 feet. They generally infest the upper part of the intestinal canal. Worms occur most frequently in children. One of the most common symptoms is general emaciation without diminution of appetite, sometimes with hardness and swelling of the belly, or local pains and uneasiness, disturbance of sleep, &c.; but most of the symptoms, whether local or general, are equivocal, being liable to be produced by other causes. For the expulsion of worms various vermifuges are employed, consisting mainly of drastic purgatives, along with tonics. For the *Ascarides* clysters, and for tape-worm, turpentine, fern, and other remedies are used. See TAPE-WORM.

**WORMWOOD** (*Artemisia absinthium*), a plant of the natural order Compositae. The dried herb, or the flowering tops, under the name of wormwood, is used as an aromatic bitter tonic, and as an anthelmintic. It is also employed in the preparation of some liqueurs, particularly of one now very largely consumed in France under the name of *absinthe*, the excessive use of which is attended with very injurious effects, which have been erroneously attributed to the wormwood it contains, instead of to the alcohol in which the wormwood is infused. *A. dracunculus* is the Tarragon, the leaves of which are sometimes used in pickles, &c. *A. cina* yields the official santonica of the British Pharmacopoeia, and which is known as Levant worm-seed, being the produce of Central Asia. It owes its properties essentially to the presence of a crystalline neutral principle called *santonin*, which is also official in the British Pharmacopoeia. Both santonica and santonin are valuable anthelmintics. *A. abrotanum* is the well-known southern-wood, a native of France, Spain, and Italy, introduced into Great Britain, where it grows luxuriantly, but seldom flowers. It is to be found in almost every cottage garden. The leaves and tops have a strong, and to most people an agreeable smell. The taste is pungent, bitter, and somewhat nauseous. It was formerly used in medicine as a stomachic, but has long been given up.

**WORSTED.** See WOOLLEN MANUFACTURE.

**WORT.** See BREWING.

**WORTHING**, a mun. borough and watering-place in England, in the county of Sussex, 12 miles west of Brighton; with some good streets, handsome terraces, crescents, and villas. Worthing is provided with every requisite to render it a fashionable resort, having splendid hotels and lodgings, baths, smooth sands, a beautiful esplanade, libraries, a literary institution, reading-rooms, and assembly-rooms. Fruit-growing is an important industry of the town. Pop. (1891), 16,606; (1901), 20,006.

**WOTTON, SIR HENRY**, a diplomatist and miscellaneous writer, youngest son of Thomas Wotton, was

born in Kent in 1568. After receiving a classical education at Winchester School he was entered at Oxford, where he much distinguished himself by his attention to logic and philosophy, and composed a tragedy. Having studied civil law under an eminent Italian professor, he became a proficient in the Italian language. His father bequeathing him a moderate income, he determined, in 1589, to travel, and visited all the principal countries of the Continent. On his return he was appointed secretary to the Earl of Essex, whom he attended in his maritime expeditions against the Spaniards, and afterwards to Ireland. On the fall of that nobleman he quitted the kingdom and resided at Florence, where he composed a treatise, printed after his death, entitled the State of Christendom. While thus employed, the Grand-duke of Tuscany having intercepted some letters disclosing a plot to take away the life of James, king of Scotland, he engaged Wotton to carry secret intelligence of it to that prince. This service he ably performed in the character and guise of an Italian, and returned to Florence. When James came to the English crown he sent for Wotton, knighted him, and in 1604 employed him as an ambassador to the Republic of Venice. As Wotton passed through Augsburg, being desired to write in an album, he wrote in Latin that 'an ambassador is a good man, sent to lie abroad for the good of his country'. This innocent sally was, by the malignity of Scioippius, represented as a state maxim sanctioned by the religion of the King of England. James, who thought nothing relative either to king-craft or state-craft a subject for wit, was, in consequence, highly displeased; and on his return Wotton had to make humble apology. At length he recovered the royal favour, and was trusted with a mission to the United Provinces, and subsequently restored to his former post at Venice, where he remained four years (1616-1619). Other missions followed, to the Duke of Savoy, and to various princes in Germany, on the affairs of the elector palatine. A third embassy to Venice closed his diplomatic labours, from which he did not return until early in 1624. In this year he was made provost of Eton College. The first-fruits of his leisure were his Elements of Architecture. James had dispensed him from the necessity of taking orders in the church, but he took deacon's orders. In 1627 Charles I. granted him a pension of £200, raised to £500 in 1630. He had planned a life of Luther; but laid it aside for a history of England, in which he made very little progress. He died in December, 1639. There is a collection of miscellanies published after his death, under the title of Reliquiae Wottonianae. This collection includes a number of poems by Wotton, of which two, The Character of a Happy Life and On his Mistress, the Queen of Bohemia, are among the finest lyrics in the English language. See Lives by Izaak Walton (1651) and A. W. Ward (1899).

**WOLFE'S BOTTLE**, a bottle with three necks used for containing liquids through which gases are to be conducted.

**WOUNDS** are divided by writers on surgery into several kinds, the distinctions being founded either upon the sort of weapon with which the injury has been inflicted; or upon the circumstance of a venomous matter having been introduced into the part; or, lastly, upon the nature of the wounded parts themselves, and the particular situation of the wound. Hence we have *cuts*, *incisions*, or *incised wounds*, which are produced by sharp-edged instruments, and are generally free from all confusion and laceration. The fibres and texture of the wounded part have suffered no other injury but their mere division; and

there is, consequently, less tendency to inflammation, suppuration, gangrene, and other bad consequences than in the generality of other species of wounds. Incised wounds also may usually be healed with greater quickness and facility than other wounds which are accompanied with more or less of contusion and laceration: the surgeon has only to bring the opposite sides of the wound into contact with each other, and keep them in this state a few hours, and they will unite and grow together. Another class of wounds are *stabs*, or *punctured wounds*, made by the thrusts of pointed weapons, as bayonets, lances, swords, daggers, &c., and also by the accidental and forcible introduction of considerable thorns, nails, &c., into the flesh. These wounds frequently penetrate to a great depth so as to injure large blood-vessels, viscera, and other organs of importance; and as they are generally inflicted with much force and violence the parts suffer more injury than what would result from their simple division. It also deserves notice that a great number of the weapons or instruments by which punctured wounds are occasioned increase materially in diameter from the point towards their other extremity; and hence, when they penetrate far, they must force the fibres asunder like a wedge, and cause a serious degree of stretching and contusion. It is on this account that bayonet wounds of the very soft parts are ordinarily followed by violent inflammation, an alarming degree of tumefaction, large abscesses, fever, delirium, and other very unfavourable symptoms. The opening which the point of such a weapon makes is quite inadequate to the passage of the thicker part of it, which can only enter by forcibly dilating, stretching, and otherwise injuring the fibres of the wounded flesh. A third description of wounds are the *contused* and *lacerated*, which strictly comprehend, together with a variety of cases produced by the violent application of hard, blunt, obtuse bodies to the soft parts, all those interesting and common injuries denominated *gunshot* wounds. Many bites rank also as contused and lacerated wounds. In short, every solution of continuity which is suddenly produced in the soft parts by a blunt instrument or weapon which has neither a sharp point nor edge must be a contused, lacerated wound.

*Poisoned wounds* are those which are complicated with the introduction of a venomous matter or fluid into the part. Thus the stings and bites of a variety of insects afford us examples of poisoned wounds; and the surgeon, in the dissection of putrid bodies, or in handling instruments infected with any venomous matter, is exposed to the danger of poisoned wounds from cuts. The most dangerous, however, of this class of wounds occur from the bites of the viper, the rattlesnake, &c. (see *VENOMOUS ANIMALS*), or from those of rabid animals. (See *HYDROPHOBIA*.) Wounds may likewise be universally referred to two other general classes, the simple and complicated. A wound is called *simple* when it occurs in a healthy subject, has been produced by a clean, sharp-edged instrument, and is unattended with any serious symptoms. A wound, on the contrary, is said to be *complicated* when the state of the system, of the wounded part, or the wound itself, indicates the necessity for more complex treatment than the simple reunion of the cut surfaces. The differences of complicated wounds must therefore be very numerous, as they depend upon many incidental circumstances, the principal of which, however, are hemorrhage, nervous symptoms, contusion, the unfavourable shape of the injury, the discharge or extravasation of certain fluids, indicating the injury of particular bowels or vessels, &c. All large or deep wounds are attended with more or less of symptomatic fever, which usually comes on at

a period varying from sixteen to thirty-six hours after the infliction of the injury, and is generally of the inflammatory, but sometimes of an asthenic character. The liability to gangrene is also a formidable danger to be guarded against in the treatment of complex wounds.

**WOURALI POISON.** See *CURARA*.

**WOUVERMAN, PHILIP**, was born at Haarlem in 1619, and was the son of Paul Wouverman, a painter of history of mean talents, who taught him the rudiments of the art, after which he became the scholar of Jan Wynants, and arrived at such a degree of perfection as to be esteemed superior to all his contemporaries. The subjects of which he seemed most particularly fond were huntings, hawkings, encampments of armies, farriers' shops, and all kinds of scenes that afforded him a natural opportunity of introducing horses, which he painted in the greatest perfection. Sweetness of colouring; correctness of design, especially in cattle or figures and variety of attitudes in horses; choice and delicacy in treatment of scenery; judicious use of chiaroscuro; and harmony of composition; are all to be admired in this artist. Notwithstanding his uncommon merit he had not the good fortune during his life to meet with encouragement equal to his desert, for, with all his assiduity and extreme industry, he found it difficult to maintain himself and his family. The neglect with which he was treated affected him so strongly that a few hours before he died he is said to have ordered a box filled with his studies to be burned, saying, 'I have been so badly rewarded for all my labours that I would prevent my son from being allured by those designs to embrace so miserable and uncertain a profession as mine.' He died in 1668. After the death of Wouverman the value of his pictures increased to an incredible degree; they were universally coveted through every part of Europe, particularly by the Dauphin of France and the Elector of Bavaria, who bought all that could be procured, at very large prices.

**WRACK, or SEA-WRACK.** See *FUCACEÆ*.

**WRANGEL, KARL GUSTAV.** See *THIRTY YEARS' WAR*.

**WRANGLER**, in Cambridge University a term applied to those students (usually about thirty in number) who have attained the first class in the first part of the examination for honours in mathematics, commonly called the *mathematical tripos*. The student taking absolutely the first place in the examination is called the *senior wrangler*, those following next being respectively termed *second*, *third*, *fourth*, &c., *wranglers*. This examination qualifies for honours in mathematics, but successful students may proceed to the second part.

**WRASSE.** See *LABRIDÆ*. The Rainbow Wrasse (*Julis Mediterranea*), figured at *ICHTHOLOGY*, Pl. III., fig. 1, belongs to a different genus from the wrasses proper (*Labrus*), the genus *Julis* being distinguished by the head wanting scales altogether.

**WREATH**, in heraldry, a roll of fine linen or silk (like that of a Turkish turban), consisting of the colours borne in the escutcheon, placed in an achievement between the helmet and the crest, and immediately supporting the crest.

**WRECK**, in navigation, is usually understood to mean any ship or goods driven ashore or found floating at sea in a deserted or unmanageable condition; but in the legal sense of the word in England *wreck* must have come to land; when at sea it is distinguished by the barbarous appellations of *flotsam*, *jetsam*, and *ligan*. (See *FLOTSAM*.) In rude and uncivilized countries the treatment of unfortunate mariners is generally arbitrary and cruel. To this jealousy and suspicion of strangers and the cupidity



excited by their wealth and defenceless condition conspire. Even amongst the early Greeks and Romans strangers and enemies were regarded in the same point of view. They were in most instances either put to death or sold as slaves. But at a later period the Roman law made it a capital offence to destroy persons shipwrecked or to prevent their saving the ship; and the stealing even of a plank from a vessel shipwrecked or in distress made the party liable to answer for the whole ship and cargo. During the gloomy period which followed the subversion of the Roman Empire and the establishment of the northern nations in the southern parts of Europe the ancient barbarous practices with respect to shipwreck were everywhere renewed. Those who survived were in most countries reduced to servitude; and their goods were everywhere confiscated for the use of the lord on whose manor they had been thrown. Nothing can more strongly evince the prevalence and nature of these enormities than the efforts that were made as soon as governments began to acquire authority for their suppression. The regulations as to shipwreck in the laws of Oleron are in this respect most remarkable. The 35th and 38th articles state that 'Pilots, in order to ingratiate themselves with their lords, did, like faithless and treacherous villains, sometimes willingly run the ship upon the rocks, &c., for which offence they are held to be accursed and excommunicated, and punished as thieves and robbers. The fate of the lord is still more severe. 'He is to be apprehended, his goods confiscated and sold, and himself fastened to a post or stake in the midst of his own mansion-house, which, being fired at the four corners, all shall be burned together, the walls thereof be demolished, the stones pulled down, and the site converted into a market-place for the sale only of hogs and swine to all posterity.' The law of England, like that of other modern countries, adjudged wrecks to belong to the king; but the rigour and injustice of this law were modified as early as the reign of Henry I., when it was ruled that if any person escaped alive out of the ship it should be no wreck: and, after various modifications, it was decided in the reign of Henry III. that if goods were cast on shore having any marks by which they could be identified they were to revert to the owners if claimed any time within a year and a day. By the statute 27 Edw. III. cap. xiii. if a ship be lost and the goods come to land they are to be delivered to the merchants, on their paying only a reasonable reward or salvage to those who saved or preserved them. But these ancient statutes, owing to the confusion and disorder of the times, were very ill enforced; and the disgraceful practices previously alluded to continued to the middle of the last century. The laws relating to wreck and salvage were consolidated by 9 and 10 Vict. cap. xcix., and are now mostly contained in the Merchant Shipping Act, 57 and 58 Vict. cap. lx. (1894), which repealed and re-enacted a long series of acts from the Merchant Shipping Act of 1854 down to one passed in 1892. If a wreck be plundered by a tumultuous assemblage the inhabitants of the county, city, or borough lying nearest shall make good the damage to the owners in the manner provided in 1 George I. statute 2, cap. v. in regard to repairing damage to churches. A penalty not exceeding £50 is incurred by plundering in case of shipwreck, by obstructing the saving of shipwrecked property, or secreting the same, and by endeavouring without leave of the master or authority of the receiver to board any shipwrecked vessel. Any one carrying off wreck and selling it in a foreign port is guilty of felony and liable to four years' penal servitude. For assistance in saving life or property in any vessel stranded or in distress on

the shores of the United Kingdom expenses and salvage are to be paid. Claims for salvage up to £1000 where the parties cannot agree may be settled by two justices of the peace. Claims for salvage above £1000 are to be settled by the Court of Admiralty in England and Ireland and by the Court of Session in Scotland. The board of trade may pay salvage on life if there is not sufficient value in the ship to do so.

WREDE, KARL PHILIPP, PRINCE, a Bavarian field-marshal, was born 29th April, 1767, at Heidelberg, where he received a sound education, law and the valuation of forest lands forming part of his studies. Backed by the influence of his influential relatives he was appointed in his twenty-fifth year to the important post of assessor to the High Court of Heidelberg, and on the outbreak of war between France and Austria he became civil commissary for the Palatinate in the Austrian army. He not only discharged the functions of his office for five years in the armies of Wurmser, Duke Albert, and the Archduke Charles, but likewise took part in the military operations, and had in 1795 obtained a colonelcy. In 1799 he was commissioned to raise a corps of Bavarian volunteers, with which he joined the archduke on the 14th October. On the 3d of December, 1800, he was engaged in the battle of Hohenlinden, where he had the rank of major-general, and after the battle he covered the retreat of the defeated Austrian army. During the peace which followed he was occupied with the organization of the Bavarian army, was appointed lieutenant-general in 1804, and was appointed to the chief command of all the Bavarian forces in the field in 1805. In the campaign of that year, owing to the Franco-Bavarian alliance, we find Wrede fighting on the side of his former foes. He took an important part in the battle of Memmingen (13th October), the siege of Danzig (20th March to 27th May, 1807), in the operations in the Tyrol (1808), and at the battle of Wagram (6th July, 1809), in which he was wounded, his services on this occasion being rewarded with the grade of field-marshal and the title of count. In 1812 he accompanied Napoleon in his fatal Russian campaign as commander of the Bavarian cavalry, and scarcely brought back a single horse from the Russian snows. In October, 1813, after Bavaria had been detached from the French alliance, at the head of 170,000 men he attempted to cut off the retreat of Napoleon, who had been defeated at Leipzig. He threw himself before the French at Hanau, but the emperor, though at the head of a greatly inferior force, inflicted on him a severe defeat (30th October). In the French campaign of 1814 he was engaged in many petty conflicts, and in 1815 was about to take part in a second invasion of France on the Lorraine frontier, when the battle of Waterloo rendered his advance unnecessary. He was now created a prince, and the estate of Ellingen conferred upon him. He was intrusted with several important diplomatic commissions, and succeeded in 1832 in putting down without violence the serious disturbances which had broken out in Rhenish Bavaria. He died on the 12th December, 1838.

WREN, a general name given specially to species of a sub-family of Insectores (which see) belonging to the Tenuirostral division, and characterized by their generally small size; by their long tarsi and toes, the outer toe being elongated and slender; the bill being curved, and the tip of the upper mandible entire. The wings are short and rounded, as also is the tail. The Common Wren (*Troglodytes vulgaris*, ORNITHOLOGY, Pl. III., fig. 1) is one of the smallest of all resident British birds. It is, with the exception of the Golden-crowned Wren, the smallest bird

in Europe, and averages 4 inches in length. It is fond of prying about crevices and holes in walls, ruined buildings, &c., and is constantly in motion, searching for insects, which form its accustomed food. It nestles in similar situations, or under house-eaves. The male sings sweetly in summer. These birds pair about the middle of spring, and build their nests in April. The nests are constructed of hay, moss, and other materials. Two broods are produced annually. The colour is reddish-brown, which is palest on the under parts; but white and pied varieties are sometimes seen. The *Troglodytes domestica* is the Common or House Wren of the United States, which is even more familiar than the wren of Britain. The name 'Wrens' has also been given to certain Insessores included in the family of the (Dentirostral) Sylviæ or Warblers (which see). Thus the famous Golden-crested Wren or Kinglet (*Regulus cristatus*) and the Fire-crested Wren (*R. auricapillus*) belong to this family, and to the sub-family of the Sylvine or Lusciniæ (see GOLDEN CRESTED WREN, and ORNITHOLOGY, Plate II., fig. 16); and a third species, very rare in England, and named the Dalmatian Wren or *Regulus (R. modestus)*, has also been described. The Emeu Wren (*Stipiturus malachurus*) belongs to the sub-family *Malurine*, and occurs in Australia. The tail-feathers are very long, and almost destitute of webs. The colour is brown, and the throat in the males is tinged with blue. The names Yellow and Willow Wren are given to the Willow-warbler (*Sylvia Trochilus*). See WARBLER.

WREN, SIR CHRISTOPHER, a celebrated English architect, was the son of the rector of East Knoyle, in Wiltshire, where he was born in 1632. He entered as a student at Wadham College, Oxford, in 1646, previously to which time he had given proofs of his genius by the invention of astronomical and pneumatic instruments. In 1647 he wrote a treatise on spherical trigonometry upon a new plan, and the following year composed an algebraical tract on the Julian period. In 1653 he was chosen a fellow of the College of All-Souls. He was one of the earliest members of the Philosophical Society at Oxford, which was the origin of the Royal Society, after the institution of which, in 1663, he was elected a fellow, and distinguished himself by his activity in promoting the objects of that institution. In 1657 he was appointed professor of astronomy at Gresham College, but, on being nominated to the Savilian professorship of astronomy at Oxford, resigned the former office, and in 1661 returned to the university. He received a commission, in 1663, to prepare designs for the restoration of St. Paul's Cathedral, then one of the most remarkable Gothic edifices in the kingdom. To prepare himself for the execution of this great undertaking he made a visit to France in 1665, and then finished the designs; but while they were under consideration the cathedral was destroyed by the fire of 1666, and the plan of repairing it was relinquished. Wren had now an opportunity for signaling his talents by the erection of an entirely new structure. The contemporaneous destruction of fifty parochial churches and many public buildings also furnished an ample field for his genius: and he would have had the honour of founding, as it were, a new city, if the design which he laid before the king and Parliament could have been adopted; but private interests prevented its acceptance. In 1668 he succeeded to the office of surveyor of works. He resigned his Savilian professorship in 1673. In 1674 he received the honour of knighthood; and in the following year the foundation of the new cathedral was laid. In 1680 he was chosen president of the Royal Society. In 1683 he was appointed architect and one of the

commissioners of Chelsea College; and the following year controller of the works at Windsor Castle. He was elected member of Parliament for the borough of Plympton in 1685. To his other public trusts were added, in 1698, that of commissioner for the repair of Westminster Abbey, and, in 1699, that of architect of Greenwich Hospital. In 1700 he represented in Parliament the boroughs of Weymouth and Melcombe Regis. In 1708 he was made one of the commissioners for the erection of fifty new churches in and near the city of London. After having long been the highest ornament of his profession he was, in 1714, deprived of the surveyorship of the royal works from political motives. He was then in the eighty-fifth year of his life, the remainder of which was devoted to scientific pursuits and the study of the Scriptures. He died February 25, 1723. His remains were interred, with the requisite honours, under the choir of St. Paul's Cathedral; and over the entry to the choir is the following inscription in his honour:—

‘Subtus conditur  
Hujus Ecclesiæ et Urbis Conditor,  
Christ. Wren;  
Qui vixit Annos ultra nonaginta,  
Non sibi sed Bono publico.  
Lector, si Monumentum queris,  
Circumspice.’

(Beneath is laid the builder of this church and city, who lived above ninety years, not for himself but for the public good. Reader, if thou seekest his monument, look around.)

The edifices constructed by this architect were principally public, including a royal hunting seat at Winchester, and the modern part of the palace at Hampton Court. Some of the most remarkable of his buildings, besides St. Paul's, are the monument on Fish Street Hill, the theatre at Oxford, the library of Trinity College, Cambridge; the hospitals of Chelsea and Greenwich; the church of St. Stephen's, Walbrook; those of St. Mary-le-Bow, St. Michael, Cornhill, and St. Bride, Fleet Street; and the great campanile of Christ-church, Oxford. The Royal Exchange and Custom-house, since destroyed by fire and re-erected, were among his works. Of his character as a man of science we may accept the testimony of Newton, who, in his *Principia*, joins the names of Wren, Wallis, and Huygens, whom he styles *hujus ætatis geometrarum facile principes* (the greatest geometricians of the age). As an architect he possessed an inexhaustible fertility of invention combined with good natural taste and profound knowledge of the principles of his art. His talents were particularly adapted to ecclesiastical architecture; in his palaces and private houses he has sometimes sunk into a heavy monotony, as at Hampton Court and Winchester. The interior of the church of St. Stephen's, Walbrook, which has been considered as his *chef-d'œuvre*, exhibits a deviation from common forms equally ingenious and beautiful. The Monument is grand and simple; and St. Paul's Cathedral may be fairly reckoned among the most magnificent productions of architectural genius. Yet the works of Sir Christopher Wren have not passed without censure. Even in St. Paul's, while the grandeur of the whole work is admitted, many faults, and especially waste of interior space, are charged against him.—See *Parentalia*, or *Memoirs of the Family of the Wrens* (folio, 1750), published by his grandson; and *Elmes's Life of Wren* (4to, 1823).

WREXHAM, a market-town and municipal and parliamentary borough of North Wales, in the county of Denbigh, and 12 miles south of Chester, in a district containing coal, lead, and iron. It is a station on the Great Western and Great Central Railways, and has several churches and other places

of worship, schools, guildhall, infirmary, barracks, market-halls, public baths, electricity-works, free library, &c. The parish church, dedicated to St. Giles, was erected in the reign of Henry VII., and is an exquisite specimen of florid Gothic. It was restored in 1867, and its tower was thoroughly repaired in 1902. There are in the town large breweries, tanneries, &c. Wrexham is one of the Denbigh district of boroughs. Pop. of mun. bor. in 1891, 12,552; in 1901, 14,966.

**WRIST** (*carpus*). See **HAND**.

**WRIT**, a precept issued by some court or magistrate in the name of the government, the executive branch of the government, or that of the state, or people of the state, intending, in any case, the supreme authority or its representative, addressed to a marshal, sheriff, constable, or other subordinate executive officer, commanding him to do some particular thing. Writs are distinguished into *original* and *judicial*, the former being such as a party sues out without any direction of the court in the particular case; the latter, such as are issued in pursuance of a decree, judgment, or order of a court. The different descriptions of writs are too numerous to be specified and described in this article. The term *writ* is, however, not confined to the proceedings in a suit; for there are writs of election, ordering certain officers to be chosen; writs in the nature of a commission, for instance, summoning one to be chief justice (2 Coke's Ins. 40), or to take the degree of sergeant-at-law; so there are writs of protection, issued, for instance, to secure a person from arrest while he is attending as a party in a suit. In England writs usually issue in the name of the sovereign.

*Writ of Error* is a commission to judges of a superior court, by which they are authorized to examine the record upon which a judgment was given in an inferior court, and on such examinations to affirm or reverse the same according to law.

**WRITER'S CRAMP**, or **SCRIVENER'S PALSY**, an affection to which those who have been accustomed to write much are liable, and which prevents them from writing with any regularity, and in severer cases even from writing legibly. The person afflicted with this trouble has not complete control over the muscles of the thumb and middle and fore finger, brought into use in writing, although all other manual operations are performed without difficulty. The affection hardly ever manifests itself before middle age. The various methods of treatment that have been proposed for this disease have not been very successful. Small surgical operations have been performed with occasional, but far from general good results. The application of electricity to the adductor of the thumb, and the kneading of the muscles of the ball of the thumb and the lower part of the forearm, so as to promote the circulation in those parts, are said to be beneficial, but the only way to obtain perfect relief is for the patient to abstain from writing altogether. If he is obliged to write he will do so with more ease if he uses a pen with a very thick handle (perhaps  $\frac{3}{4}$  inch thick). For extreme cases several contrivances have been devised for assisting the patient to write by altering the movements of the fingers in writing, and giving support to the ball of the hand; but there can be no doubt that the use of the type-writer, a description of which is given under the proper heading in this work, would be of far more service than all such inventions in giving relief to those annoyed with this trouble.

**WRITERS (or CLERKS) TO THE SIGNET**, a legal society of Scotland which conducts a great part of the legal business of Edinburgh, being the principal body of law-agents before the supreme courts, and being also largely employed as conveyancers and

agents for property. They derive their name from having been originally clerks in the office of the secretary of state in which the acts passed under the king's signet were prepared. Admission to the body was by apprenticeship, fees, and examination, both public and private, attendance at two courses of arts and four courses of law at the university being required as a preparation. By act 36 and 37 Vict. cap. lxiii., August 5, 1873, the exclusive right to practise before the supreme and inferior courts of Scotland has been transferred to a body called law agents constituted in terms of the act, and who include writers to the signet.

**WRITING**, the art of recording ideas by means of characters or figures of some sort impressed upon some kind of material substance. History, though it does not throw complete light on the origin of writing, suffices to show certain stages in its progress, and upon these a classification has been founded, which is, however, incomplete and unsatisfactory. The simplest classification, and perhaps at an initiatory stage the best, is that which divides all writing into ideographic and phonographic, or signs representing the things symbolized by words, and signs representing sounds, that is, words themselves. Less satisfactory is the classification of writing into three historical stages, the figurative, the transitional or conventional, and the alphabetic. In the first of these, to which hieroglyphic writing belongs, writing is supposed to be pictorial, or immediately representative of objects. After this, in the transitional period comes symbolical writing, in which abbreviated pictures are transformed into arbitrary symbols, first of things, and afterwards of sounds and words. Lastly, with the prevalence of phonetic writing sounds are represented first in syllables, and afterwards in letters. The course of writing is generally in the direction thus indicated, but it is inaccurate and misleading to represent these stages as epochs in its progress. As the most modern writing contains traces of the first of these methods, so the earliest contains traces of the last. The majority of the letters in modern alphabets can be traced to symbols, or abbreviated pictures representative of things, but as the thing originally represented is usually an object whose name begins with the sound represented by the letter, there is no evidence that the sign was not originally intended in a double sense, and used as a phonograph. In Egyptian hieroglyphics we have ideographs and phonographs mixed together. This, however, does not prove the absolute precedence of ideographs, but only the imperfection of the phonographic elements in that system. The same thing occurs in the Mexican picture writing, which was long supposed to be purely ideographic. Its phonetic signs are syllabic, not alphabetic. In our own system we use figures and other symbols when phonographic signs are too slow for our purpose, and with a less perfect phonographic system this would naturally occur much more frequently. It does not appear, moreover, that any transition from pictorial to phonetic writing is necessary through arbitrary non-phonetical symbols. Both of these modifications would no doubt proceed simultaneously from independent causes. Pictorial signs not phonetized would be abbreviated as well as phonetized signs, and when the phonetized abbreviations came to prevail the non-phonetized abbreviations would be phonetized also, thus producing the appearance of a transition from arbitrary symbols to phonetic signs.

The reason why writing has had to pass through various stages of pictorial and more or less arbitrary symbolical representation before reaching the more perfect development of the alphabetic form is not very difficult to discover, and it has an important

bearing on the order of development. It is not because the representation of words is in itself more difficult to conceive of than the representation of things, or because when the desire for writing as a medium of communication is excited the human intellect is inadequate to the task of forming at once an entire phonetic system. Had phonetic or even alphabetic representation been the only possible means of constructing a written symbol all difficulties would doubtless have been overcome by one sustained effort, as they have actually been by many partial ones; but as an easier process was to be found, and would directly suggest itself as a means of meeting the immediate demand, the more elaborate process was excluded and prevented by this process from being performed. Nothing is easier than to make a rude pictorial representation of certain objects. To draw something resembling a man would be easier than to agree on a sign to represent the word man, hence ideographs would naturally precede phonetic symbols. But for the same reason the earliest systems of writing would not be purely ideographic but mixed. There are many things which form the subject of the least sophisticated human communications which cannot be represented pictorially. When writing was first practised these things were already represented by words, and the idea would naturally occur to form a sign to represent the word, that is, a phonetic sign. These signs could not be directly pictorial, but they might be allegorical or symbolic, and in the absence of analysis of sound they probably would take that form, although the direct intention was to suggest conventionally a specific word by the symbol. This sort of symbol might be called a mnemonic. From such symbols to merely arbitrary syllabic and alphabetic symbols the transition would be easy.

It is generally agreed that writing was introduced to the western nations by the Phœnicians, and it is commonly believed that the Phœnician system was based on the Egyptian, but the comparative antiquity of the Egyptian and Assyrian or Akkadian, the hieroglyphic and cuneiform systems, cannot be definitely determined. The Egyptians attributed their writing to Thoth, and the first characters are said to have consisted of portraits of the gods. The cuneiform writing, which is cumbersome and exceedingly difficult to read, has been adapted to several languages, the Akkadian, the Assyrian, the Persian, &c., in a variety of ways, ideographic, syllabic, and alphabetic. (See CUNEIFORM WRITING.) The Egyptians had three distinct kinds of writing, the hieroglyphic, the hieratic, and the enchorial or demotic. The first is a mixed system, containing large numbers of signs of various characters, ideographic and phonetic. It is used chiefly for inscriptions on monuments and public buildings. The hieratic is a cursive hand abridged from the hieroglyphic for use on papyri. Both these forms were sacred, and the priestly caste only were initiated in them. The demotic was introduced much later than the other forms. It was used for trading and common purposes, and in civil documents. The hieratic writing was more phonetic than the hieroglyphic, and the alphabetic character prevailed in the demotic. The first was written in any direction according to the form of the surface; the hieratic was at first written in columns, but afterwards always in horizontal lines. The hieratic and demotic are read from right to left, but the individual letters are formed from left to right. (See HIEROGLYPHICS.) The connection between the Egyptian and the Semitic writings, to which the Phœnician belongs, is by no means unanimously admitted, many scholars holding that the resemblances between them may be explained by the independent adoption of

common principles. The leading Semitic forms are the Samaritan or ancient Hebrew, the Chaldean or East Aramaic, the Syriac or West Aramaic, and the Kufic or early Arabic, which continued to be used in MS. for several centuries after the Mohammedan conquest, after which it was replaced by the Neshki or modern Arabic, which, with some slight modifications, is the same with the modern Persian. The Hebrew alphabet now in use, the Babylonian or East Aramaic, is entirely consonantal, the vowel points being of modern origin. The Phœnician which formed the basis of the western languages was of a similar character. (See HEBREWS, PHœNICIA, ALPHABET.) Phœnician writing was anciently represented to have been brought by a Cadmean colony to Bœotia about the sixteenth century B.C. (see CADMUS); and a certain number of the Greek letters are undoubtedly of Phœnician origin. See the section on language and writing in the article GREEK. The Greeks at first wrote from right to left, and afterwards adopted the method called *boustrophædon* from the motion of the ox in ploughing, that is alternately from right to left, and from left to right. Writing from left to right was said to have been introduced in the time of Homer by Pronapides of Athens. The various modifications which the Phœnician or Pelasgian forms underwent in Italy are to be found by comparison of the Oscan, Etruscan, Umbrian, and early Latin inscriptions. (See EUGUBINE TABLES.) In the ancient Greek and Roman writing, and even for a time in the mediæval writing of Europe, the words were not separated by spaces, and no punctuation marks were used. The present cursive characters with modifications occur in Greek inscriptions of the age of Augustus. In mediæval manuscripts a variety of styles were adopted in different epochs and countries, and for different uses, to describe which in detail would require a separate treatise. In France the various styles were called after the dynasties under which they prevailed: Merovingian, Carolingian, Capetian, Valésian, and Bourbon. There were also a variety of styles used for different purposes distinguished by such names as *majuscule* and *minuscule* (great and small letters), diplomatic minuscule, and many others. Capitals were not then used as now to distinguish prominent words, but whole manuscripts were written in large or small capitals. There were also a variety of mixed styles. From the eighth to the eleventh centuries writing with *tremblements* was affected in France. The diplomatic minuscule was a mixture of minuscule and cursive characters distinguished by an unusual prolongation of the long letters. Uncial letters, which prevailed from the seventh to the tenth centuries, were rounded capitals with few hair-strokes. The practice of ornamenting pages began in the eighth century, and the earliest manuscripts are also without title-pages. The so-called Gothic characters, in reality of scholastic origin, are merely fanciful deviations from the Roman types, such as the rounding of straight limbs, the substitution of angular facets for rounded forms, with hair-lined projections from the extremities contrasting with massive body-strokes. They became common in inscriptions from the thirteenth to the fifteenth centuries, and were employed in church-books from the time of St. Louis. The Gothic cursive was introduced about the middle of the thirteenth century. The modern German alphabet was also introduced in the thirteenth century. In England a variety of styles called Saxon prevailed in the early middle ages. An elegant mixed style was formed of a combination of Roman Lombardic and Saxon characters. The Norman style of writing came in with William the Conqueror. The old English form of Gothic dates from the

middle of the fourteenth century. The English 'court hand', an adaptation of Saxon, prevailed from the sixteenth century to the reign of George II. In regard to the antiquity of writing in other parts of Europe, it was known to the Gauls before the time of Cæsar; but no traces of the ancient writing remain, and whether it was derived from the Greeks or the Phœnicians is doubtful. There are slight traces of writing in Britain previous to the Roman period, but if it were employed by the Druids, as Cæsar says, it may have existed without leaving remains. The Germans claim the knowledge of writing previous to their contact with the Romans; but in their case also we are without early remains. The Runic alphabet used for many centuries in Denmark, Norway, &c., may have been employed long before the Christian era. The age and origin of Oghams are doubtful. See OGHAMS.

In the East we find one of the most striking contrasts in the history of language. The Chinese, who have an ancient system of writing which they attribute to Fou-hi, have never reached the alphabetic system. Their characters are syllabic, and as Chinese words are monosyllables, they are strictly ideographic. They have been adopted in this way by peoples speaking not only different dialects, but different languages, who apply the signs to words of different sound but of the same signification as the original. The Chinese system is said to contain 40,000 characters. They were originally hieroglyphic, but from difficulty of interpretation have become conventional. There are, of course, certain general principles of combination and construction, but to master the whole system is said to be the work of a lifetime. Only a limited portion of it can therefore have any real existence as a medium of communication. Sanskrit, on the other hand, possesses the most perfect known alphabet. The Hindus claim to have derived it from the gods, and call one form of it *devanāgarī* (divine city). It is wholly different from the Semitic, and is founded on a much more complete and subtle analysis of sound. Its consonant signs number thirty-three, its vowel signs fourteen. They are applied with an analytical method which gives a power of distinction vastly superior to that of European alphabets, and which is greatly admired by scholars. Sanskrit is written from left to right. By means of its derivatives it is widely diffused in the East. The Pali, which forms the sacred language of the Buddhists, has carried it far beyond India. The Burmese Pali character is square, the Siamese round. To complete the vagaries which have prevailed in the direction of writing, the Mexican picture writing was written from bottom to top.

WRITING, PHONETIC, any system of writing in which the alphabet used contains as many letters as there are different sounds in the language, each letter having one sound and not more, and the number of letters used in writing any word being no more and no fewer than the sounds of which the word is composed. All modern alphabets are phonetic in principle, but in practice few or no languages can be said to be written with strict phonetic accuracy. The English is among the farthest from being so, while the Italian and the Spanish are among those that approach most closely to the phonetic standard. The failure of the English alphabet to come up to the phonetic standard has already been pointed out in the article ALPHABET, where it is stated that, according to one analysis, there are forty-two sounds in the English language, while the alphabet has only twenty-six letters. Other analyses give a different number of sounds as existing in the English language, but in any case it is certain that there are more sounds than letters to represent them, and con-

sequently several of the letters have to do double or triple duty (a has at least four sounds). Some of the letters also, as c and x, are not required; some occasionally take the sound that strictly belongs to others, as g when it sounds like j; double letters (as sh) are used to represent simple sounds; not to mention other anomalies. In many words too letters occur that are not sounded at all, while the same combinations of letters may have very different sounds (*through, though, bough, trough, enough*), or different combinations may have the same sound (*rough, ruff*). From this state of matters it results that in the case of a great many words it is impossible to tell from the spelling how they ought to be pronounced, and accordingly the learning of our own language is rendered vastly more difficult than it would be were it written on strict phonetic principles. The desirability of a conformity between spelling and pronunciation could not fail to make itself felt early, and we find that it is long since improved alphabets have been invented on phonetic principles. Among the earliest may be mentioned that of Sir John Cheke, in the first half of the sixteenth century, other names of inventors of this class being those of Sir Thomas Smith in the same century, Bishop Wilkins in the latter part of the next century, Benjamin Franklin, Lepsius, &c. The alphabet which has been received with most favour, however, is undoubtedly that invented by Isaac Pitman, author of the well-known system of shorthand. (See SHORTHAND.) According to Sir Isaac Pitman's analysis there are thirty-nine distinct sounds in the English language (including three diphthongs). To represent these the existing letters of the alphabet are used, with the exception of c, g, and x as being duplicates or compounds, and sixteen new characters are added, the new characters representing respectively the sounds of *ch* in *cheap* or *ch* in *fetch*; the two sounds of *th* as in *this* and *thin*; the sounds of *sh* in *she* or *ci* in *vicious*; the sound of *s* in *pleasure*; of *ng* in *sing*; of *a* in *alma, father*, of the vowel sound in *ale, fair, bear*, of that in *eel, mere, eat*, of that in *law, all, or ought*, of that in *up, son*; of that in *ope, coat, pour*, of that in *do, food*, and of the diphthongal sounds in *by, now, and new*. The new characters have some resemblance in form to the old characters to which they are most closely allied. This system has already made some progress, and besides other publications there is a weekly journal printed in the phonetic character. The recommendations of this system by its advocates are mainly based on its facilitating acquirement of the art of reading, and of accurate spelling and pronunciation. The extent to which it facilitates the learning to read may be judged from the fact that it has enabled poor Glasgow children to read the Sermon on the Mount after six hours' teaching. But even while the old system prevails the phonetic system is said to be of great service. Thus it is alleged that the time usually taken by children in public schools to learn to read is from four to six years, and that even then the art is imperfectly acquired, and spelling especially is liable to be forgotten in a few years; while with the aid of the phonetic orthography children can be taught to read the present system more perfectly in eighteen months, there being no difficulty in carrying the children from the phonetic into the old style. A common argument against the introduction of this system is that the present spelling is of high value as a clue to the etymology and history of words, which would be totally obscured by the proposed phonetic reform. This argument is very summarily treated by the Rev. Prebendary Earle, in the following terms:—  
'1st, a person must know English etymology to

appreciate this sort of loss; and under such circumstances the loss is no more than sentimental. 2nd, To suffer etymological considerations to obstruct the use of the alphabet as a means of expressing sound, say for missionary purposes; or interfere with its use as the instrument of education and commercial intercourse; is to sacrifice present utility to antiquarian curiosity, and to put the cart before the horse.' Max Müller, also, did not regard the etymological argument as very formidable: 'The pronunciation of languages', he says, 'changes according to fixed laws, the spelling is changed in the most arbitrary manner, so that if our spelling followed the pronunciation of words, it would in reality be a greater help to the critical student of language than the present uncertain and unscientific mode of writing'. He stated that he was convinced of the truth and reasonableness of the principles on which the proposed reform rests, though he was 'not so sanguine as to indulge in any hope of seeing it carried out for the next three or four generations'.

**WRITING MATERIALS.** A brief conspectus may here be given of the principal materials and implements that have been used in writing, reference being made to separate articles for further information. (1) *Stone* was used among the ancient Egyptians, Babylonians, Greeks, and others as a material for receiving writing. (2) *Baked Clay* is the substance upon which the Assyrian cuneiform inscriptions were impressed. (3) Many inscribed potsherds, known as *ostraca*, have come down from ancient Egyptian times. (4) *Metals* were used by the Greeks and other ancient peoples for documents of a permanent character, and the Venetians used lead in plates for a similar purpose down to the fifteenth century. (5) The *tabule* of the Romans and *deltoi* of the Greeks were of wood coated with wax, on which records were scratched by a *stilus* or *graphium*, with a flattened end for erasing. They were used in several parts of Europe down to the fifteenth century and even later. (6) *Papyrus* (which see) was in use in Egypt from very early times, and was also extensively employed by the Greeks and Romans. Papal documents on papyrus are found as late as the eleventh century. (7) *Parchment* (which see), said to have been first made at Pergamum in the second century B.C., was in extensive use for books down to the sixteenth century. (8) *Vellum* (which see) is simply a finer form of parchment made of the skins of calves, kids, and still-born lambs. (9) *Palm-leaves* were long widely used in India. (10) *Paper* (which see), now the most important of all materials for receiving writing, is made from vegetable fibres in various forms. Inks of various colours were in use from very early times (see **INK**). Of writing implements we may mention the *stilus* or *graphium* (see above); the reed or *calamus*, in use to some extent till the fifteenth century; the quill-pen, which can be traced back to the sixth century and displaced the reed about the thirteenth (see **QUILLS** and **PEN**); the modern steel pen and the stylographic pen. See also **PENCIL** and **BOOK**.

**WROXETER**, a village of England in Shropshire, on the Severn,  $5\frac{1}{2}$  miles south-east of Shrewsbury. There is a rather interesting church, but the place is chiefly remarkable for its Roman remains, the Roman station of *Uriconium* having been here. The ancient town had a circuit of some 3 miles. Part of the area has been excavated, and tessellated pavements and other objects have been found, but not much of any artistic value.

**WRYNECK** (*Iynx* or *Iunx torquilla*), a peculiar species of Scansorial Bird, belonging to the Picidae or Woodpeckers (which see), which derives its familiar designation from its habit of twisting its head in a

curious manner. The bill is short, straight, and sharp-pointed, and the nostrils are partly hidden by a membrane. The wings are pointed. The tail is rounded, and rather short. The tarsi are scaled, and are partly covered with feathers; and the two front toes are united at their base. This bird visits Britain in summer (but seldom reaches Scotland), arriving in April, and leaving on its southward flight in August or September. It appears usually with or just before the Cuckoo, and hence is named the 'Cuckoo's Mate'. The food consists of insects, and chiefly of ants. It is also said to eat elder-berries. The tongue is long and extensile, like that of the Woodpeckers. The nest is formed in the holes of trees; and the eggs vary from six to ten. The colour is a mixture of shades of brown and gray; and the average length is 7 inches, the females being usually the smaller. See the illustration at **ORNITHOLOGY**, Pl. I., fig. 17.

**WUHU**, a treaty-port of China, opened in 1877, in the province of Nganhwei, on the right bank of the Yang-tse-kiang river, about 200 miles west of Shanghai. Some manufactures and a considerable trade are carried on. The number of vessels entered in 1901 was 2002, with a total tonnage of 2,098,840. Of these, 940, with a tonnage of 1,094,984, were British, the rest being chiefly German, Chinese, and Japanese. The total value of the imports in that year was £1,155,362, comprising cottons, opium, sugar, kerosene, bags, woollens, metals, &c.; and the exports were valued at £816,029, including rice, rape-seed, raw silk, wheat, feathers, beans, ground-nuts, &c. Wuhu suffered severely in the Tai-ping rebellion. Pop. 92,000.

**WULFSTAN**, Bishop of Worcester, was born about 1012 at Long Itchington, near Warwick. He was educated at Evesham and Peterborough, and was ordained priest before he was twenty-six years of age. He became a monk in the monastery of Worcester cathedral, and lived a life of the strictest asceticism even after 1062, when he was consecrated bishop of Worcester. He was one of those who submitted to William the Conqueror at Berkhamstead in 1066, and he was allowed to retain his see. Part of the present Worcester cathedral represents the church which Wulfstan caused to be erected between 1084 and 1089. He was a man of saintly character and loyal devotion to his work, and he is credited with having induced the merchants of Bristol to stop their traffic in slaves. He assisted in the Domesday survey, and supported the king against rebellious barons. He died on Jan. 18, 1095, and was buried in Worcester cathedral. He was canonized in 1203, his day being January 19. There is a life of him by William of Malmesbury. Another Wulfstan, who died in 1023, was archbishop of York, and has been regarded as the author of Wulfstan's Homilies, a series of discourses in Anglo-Saxon, first printed in 1880. Wulfstan of Winchester, a monk who lived about the same time, wrote metrical lives of St. Swithun and St. Ethelwold.

**WUPPER**, a river of Germany, in the governments of Cologne and Düsseldorf of the Prussian province of the Rhine. It rises on the Westphalian frontier, and flows first north-west and then south-west, joining the Rhine between Cologne and Düsseldorf after a course of about 60 miles. It is not navigable for vessels of any size, but it provides considerable power for manufacturing purposes. Its valley is the most populous in Germany, and contains the important industrial towns of Barmen, Elberfeld, and Solingen. In its upper course it is called the *Wipper*.

**WÜRTEMBERG**, or more correctly **WÜRTTEMBERG**, formerly also *Wirttemberg*, a kingdom of the



German Empire, bounded on the north-east, east, and south-east by Bavaria; on the south-west, west, and north-west by Baden; and on the south by the Lake of Constance (Bodensee), which separates it from Switzerland. It surrounds three enclaves belonging to the grand-duchy of Hesse and also the Prussian territory of Hohenzollern, and some small enclaves of Württemberg are inclosed by Baden and Hohenzollern. It has an area of 7532 square miles. The kingdom belongs to the western part of the south German plateau. On the west the Schwarzwald or Black Forest mountains enter it from Baden, and attain an elevation of 3824 feet in the Hornisgrinde, which is the highest point in the whole of Württemberg. The Suabian Jura, also known as the Suabian Alb or Rauhe Alb, traverses the country from south-west to north-east, forming the watershed between the Rhine and Danube basins. The district between these two mountain ranges, chiefly constituting the valley of the Neckar, is the fine terraced region of Lower Suabia, with a pleasant alternation of hilly landscape and fertile plains and valleys. The Upper Suabian plateau, to the south of the Danube, is generally higher than the rest of the kingdom, and is covered by irregular groups and chains of hills. Geologically the kingdom consists mainly of Triassic formations in the valley of the Neckar, flanked on the east by the Jurassic of the Rauhe Alb and on the west by intrusive rocks of the Schwarzwald. The south-eastern part of the kingdom contains a considerable area of Tertiary formations. Württemberg belongs to the basins of the Rhine and the Danube. The northern part has its drainage carried to the Rhine mainly through the Neckar, with its left-bank tributary, the Enz, and its right-bank tributaries, the Fils, Rums, Murr, Kocher, and Jagst. Other streams belonging to the Rhine drainage system are the Tauber, a tributary of the Main; the Salzach, Pfingz, Murg, and Kinzig, which flow through Baden; and the Schussen and Argen, which flow into the Lake of Constance. The course of the Danube from Tuttlingen to Ulm is mostly in Württemberg, and among the tributaries of this part of its course are the Blau on the left bank, and the Iller on the right bank, the latter forming part of the eastern boundary of the kingdom. Besides the Lake of Constance (Bodensee), of which fully one-fifth belongs to Württemberg, there are no lakes of any size. There are numerous mineral springs of various kinds in the kingdom. The climate is temperate. The mean annual temperature is about 47° F., and the mean annual rainfall is about 31·7 inches. The principal minerals are clay ironstone, salt, building-stone, limestone, and clay.

The soil is for the most part fertile and well cultivated, especially in Lower and Middle Suabia. The principal cereal crops are spelt, oats, barley, rye, and wheat. Potatoes, sugar-beet, tobacco, hops, chicory, flax, and hemp are also grown. Market-gardening is actively carried on in the valley of the Neckar between Esslingen and Cannstatt. The most productive parts of the kingdom are the district called the Filder, to the south of Stuttgart; the north-eastern part of the Jagst circle; the Strohgau district, to the north-west of Stuttgart; and parts of Upper Suabia. Fruit is extensively grown in the Neckar valley, and wine is produced on the shore of the Lake of Constance and in the valleys of the Neckar, Kocher, Jagst, Enz, and Tauber. Nearly one-third of the total area of the kingdom is under forest, three-fifths being coniferous and the rest composed chiefly of hardwood trees. Much valuable timber is cut and

exported down the Rhine. Horses, cattle, sheep, pigs, and goats are reared in fair numbers, and apiculture is a growing industry.

The greater part of the population is employed in agricultural, pastoral, and similar occupations, but manufactures are becoming constantly more important. Linen is made on the Rauhe Alb (Urach, Blaubeuren, &c.); cotton is spun in Rottweil, Reutlingen, Urach, Cannstatt, and other places; the silk manufacture is carried on in Isny, Wiesensthal, Waiblingen, and Sindelfingen; woollens are made in Stuttgart, Heidenheim, Calw, Reutlingen, &c. There are paper-factories at Heilbronn, Dettingen, and elsewhere; and leather is made in Reutlingen, Backnang, Calw, and Stuttgart. Bell-founding is carried on in Stuttgart; copper and sheet-metal goods are produced in Esslingen, Göppingen, Biberach, Ludwigsburg, and Ellwangen; machinery in Esslingen, Berg, Cannstatt, Heilbronn, Geislingen, &c.; electrical appliances in Cannstatt and Stuttgart; gold and silver wares in Gmünd, Heilbronn, and Stuttgart, &c. Other manufactured products are musical instruments (Stuttgart), furniture (Stuttgart), chocolate and confectionery, tobacco and cigars, beet-sugar (Stuttgart, Böblingen, Heilbronn), beer, chemicals, glass, and porcelain. The printing and publishing industries of Stuttgart are of great extent and importance. The trade is of considerable extent and variety. Cattle, wool, grain, timber, salt, fruit, cloth, linen, leather and leather goods, paper, clocks, musical instruments, metal goods, and chemicals are the chief exports; and among the imports are tobacco-leaves, hemp, flax, hides and skins, coal, cotton, silks, stoneware, &c. Heilbronn, Stuttgart, Ulm, and Friedrichshafen are the chief seats of commerce. The Neckar is navigable, and steamers ply on the Lake Constance. The kingdom is well supplied with railways, nearly all belonging to the state.

Almost seventy per cent of the population are Protestants, the rest being almost all Catholics, though including nearly 12,000 Jews. The affairs of the Protestant and Evangelical church are regulated, subject to the minister of worship, by a consistory and a synod consisting of the members of the consistory and the six superintendents or prelates of Schwäbisch-Hall, Heilbronn, Ludwigsburg, Reutlingen, Tübingen, and Ulm. The head of the Roman Catholic church is the bishop of Rottenburg, who is subject to the archbishop of Freiburg. School attendance is compulsory from the seventh to the fourteenth year, and attendance at an evening continuation-school is also required for two years after that age. The higher educational institutions include the University of Tübingen, with both a Protestant and a Catholic theological faculty; several gymnasia, lycæums, real-gymnasia, real-schools, &c.; normal colleges for the training of teachers; the technical high-school in Stuttgart; the veterinary high-school in Stuttgart; the agricultural academy in Hohenheim; agricultural schools in Ellwangen and elsewhere; the school of wine culture in Weinsberg; the conservatory of music in Stuttgart, &c.

Württemberg is a constitutional hereditary monarchy, with a constitution dating from 1819 and amended in 1868 and 1874. The succession to the throne is in the male line according to primogeniture, but if male heirs fail it passes to male descendants in the female line, though not to women. The king as head of the state is associated with a secret cabinet and a legislature (*Landstände*) of two houses. The first chamber of the legislature, known as the chamber of the *Standesherren*, consists of the princes of the royal house, the heads of certain princely mediatised houses, and a number, not ex-

ceeding a third of the whole, of persons nominated by the king hereditarily or for life. The president of the first chamber is appointed by the king. The second chamber, or House of Representatives, consists of thirteen nobles elected by the whole body of nobles, the six Protestant general superintendents, the Catholic bishop and two other Catholic dignitaries, the chancellor of the university, one representative of each of the so-called 'good towns', Stuttgart, Tübingen, Ludwigsburg, Ellwangen, Ulm, Heilbronn, and Reutlingen, and one representative of each of the Oberamtsbezirke, making 93 members in all. The representatives of the towns and districts are elected directly by ballot for six years. All citizens of not less than twenty-five years have a vote, and all over thirty years of age are eligible for election to the second chamber. The second chamber elects its own president. Würtemberg is represented in the Bundesrat of the Empire by four members and in the Reichstag by seventeen. There are six ministers of state, one to each of the departments, Justice, Foreign Affairs and Means of Communication, Interior, Church and School Affairs, War, and Finance. The Würtemberg troops form the thirteenth corps of the imperial army, the head-quarters being at Stuttgart. For administrative purposes the kingdom is divided into the four circles of Neckar, Schwarzwald, Jagst, and Danube. The estimated revenue for 1901-1902 was £4,452,318, and the estimated expenditure £4,434,480. The total public debt in 1901 was £24,900,168, almost all incurred in connection with railway projects. Stuttgart is the capital, and the other chief towns are Ulm, Heilbronn, Esslingen, Cannstatt, Reutlingen, Ludwigsburg, Göppingen, Gmünd, Tübingen, Tuttlingen, Ravensburg, and Heidenheim. Pop. in 1895, 2,081,151; in 1900, 2,169,434.

*History.*—Würtemberg was occupied by the Suevi in the time of the Romans, who became masters of the country in the latter part of the first century A.D. About the middle of the third century the Alemanni conquered the country and drove the Romans across the Rhine, but in 496 they were in turn defeated by the Franks under Chlodwig. Part of the future kingdom was incorporated in the Frankish empire, and part erected into a Duchy of Suabia, which maintained its existence till near the end of the thirteenth century. The house of Würtemberg traces its origin to a Conradus de Wirtinsberg, whose name appears in documents about 1090. A Ludwig, probably a son of Conrad, is the first known Count of Würtemberg, but the unbroken series of counts does not go back beyond Ulrich (1241-65). From 1442 to 1482 the land was divided between two branches of the family. Eberhard V. (1482-96) gave the country its first constitution and received the title of Duke from the emperor at Worms in 1495. The reign of Ulrich (1498-1550) was a somewhat troubled one, but of great importance as that which witnessed the introduction of the Reformation into the duchy. His son Christoph (1550-68) completed his father's religious changes. The duchy suffered much in the Thirty Years' War, during which Eberhard III. (1628-74) was its ruler. Eberhard Ludwig (1677-1733) took part in the war of the Spanish Succession. The reign of Karl Eugen (1737-93) was one of misfortune for the duchy and strenuous constitutional struggle. His nephew Friedrich I. (1797-1816) supported Napoleon for a time and was rewarded with increase of territory and the title of king (1806), but he went over to the allies in 1813 and had his new possessions and dignity confirmed to him. Under his son and successor Wilhelm I. (1816-64) the essentials of the present constitution

were agreed to in 1819. Wilhelm was followed in the kingship by his son Karl I. (1864-91), whose reign is notable for Würtemberg's opposition to Prussia's incorporation of the duchies of Schleswig and Holstein, her assistance of Austria against Prussia in the war of 1866, and her co-operation in the war of 1870-71 against France. Karl I. was succeeded by a rather distant relation, Wilhelm II., who is the present king.

WÜRZBURG, a town in the north-west of Bavaria, capital of the government of Lower Franconia, beautifully situated on both banks of the Main, which is here crossed by an old bridge adorned with statues of saints, and by two modern bridges erected in 1887 and 1895 respectively. Its old fortifications have been demolished, and the site laid out in fine promenades. There was formerly a fortress on the Marienberg, a hill about 800 feet high overlooking the town. The most important edifices are the richly-decorated cathedral, belonging to the ninth and subsequent centuries; several other fine old churches; the royal residence, a fine eighteenth-century edifice of great size, in the style of the palace of Versailles, with a grand staircase; the Julius hospital, adjoining which are the botanic garden and several of the medical departments of the university; the town-house, university, government buildings, railway-station, barracks, palace of justice, &c. The university, first founded in 1402, is celebrated for its medical faculty, to which more than half the students belong. The university library numbers about 300,000 volumes. There are also two gymnasiums, a real-gymnasium, a real-school, a polytechnic union, and other educational institutions. The manufactures are varied, and the trade is important. Well-known wines (*Steinwein*, *Leistenwein*) are produced here. Würzburg formerly gave its name to an independent bishopric, which was founded about 742, and richly endowed by the Frankish and German rulers. Ducal power in East Franconia was granted to the bishop in 1120. In 1803 the bishopric was annexed to Bavaria, but in 1805 again severed from it and erected into an electorate in favour of Grand-duke Ferdinand of Tuscany. In 1806 it became a grand-duchy, but in 1815 was restored to Bavaria. Pop. in 1895, 68,747; in 1900, 75,497.

WYANDOTS, or HURONS, an Indian tribe in N. America. In the beginning of the seventeenth century they were settled on the eastern shore of Lake Huron. About the middle of the same century, having meanwhile been converted to Roman Catholicism, they sided with the French when the latter were extending their settlements in that region. This involved them in a war with the Iroquois, in which they were nearly exterminated. The remnants of the tribe then divided. The one part removed to the neighbourhood of Quebec, where their descendants still survive; the other, after various wanderings, now occupy a reservation in the Indian Territory, being two or three hundred in number.

WYATT, RICHARD JAMES, an eminent sculptor, born in London on 3rd May, 1795; died at Rome May 29, 1850. He entered the Royal Academy as a student, afterwards worked for a time in the studio of Bosio in Paris, and ultimately completed his professional education under Canova at Rome. In the last city he took up his permanent abode from 1821, making only one brief visit to his native country in 1841. He is one of our best sculptors in the delineation of poetical and classical subjects, and his female figures especially are most beautiful and exalted creations. Among his finest works may be mentioned *A Nymph entering the Bath*, *Nymph leaving the Bath*, *Shepherd Boy*, *Rachina*, *Penelope*.

Nymph Eucharis and Cupid, Nymph of Diana taking a Thorn from a Greyhound's Foot, and a Huntress with a Leveret and Greyhound.

**WYATT, SIR THOMAS**, a distinguished poet of the age of Henry VIII., born about 1503, at Allington Castle, in the county of Kent, the seat of the family. He commenced his academical education at Cambridge, where he graduated B.A. in 1518 and M.A. in 1520. On quitting the university he went on his travels to the Continent. After his return to England he appeared at court, where the reputation he had already acquired as a wit and a poet introduced him to the notice of Henry VIII., who retained him about his person and knighted him in 1537. He was employed on several diplomatic missions to different powers, and was a friend of Cromwell, in whose fall he ran some risk of being involved, but was able to retain the king's favour. He died at Sherborne in 1542. His poetical works, which consist principally of sonnets, rondeaus, love elegies, odes, satires, &c., and a metrical translation of certain Psalms, were partly published in conjunction with those of his contemporary and personal friend, the Earl of Surrey, in 1557. They evince more elegance of thought than imagination, while his mode of expression is far more artificial and laboured than that of his friend. He is also the author of letters on business of state and letters to his son. The Sir Thomas Wyatt who headed an insurrection in the reign of Queen Mary, in 1554, and was executed on that account, was the son of this Sir Thomas Wyatt. It was the queen's resolve to marry Philip of Spain that led to the rising. Wyatt was born about 1521, and as a volunteer had served on the Continent with some distinction.

**WYCHERLEY, WILLIAM**, one of the wits and dramatists of the reign of Charles II., was the eldest son of a gentleman of Clive, in Shropshire, where he was born about 1640. After receiving a school education he was sent to France, where he embraced the R. Catholic religion. He returned to England a short time before the Restoration, and, resuming Protestantism, was entered a gentleman commoner of Queen's College, Oxford, which he left without a degree, and took chambers in the Middle Temple. He paid, however, little attention to the law, but became a man of fashion in the town, and made himself known as author of *Love in a Wood*, or *St. James's Park*, a comedy, published about the end of 1671. This piece brought him into much notice, and his popularity was increased by comedies that soon after followed: *The Gentleman Dancing-master*, published in 1673, *The Country Wife*, produced in 1672 or 1673, and *The Plain Dealer*, 1674. He became a favourite of the meretricious Duchess of Cleveland, and was much regarded by Villiers, the witty and profligate duke of Buckingham. About 1680 he improved his circumstances by marrying the Countess of Drogheda, a young, rich, and beautiful widow. At her death soon after she settled her fortune upon him; but, his title being disputed, the costs of law and other encumbrances produced embarrassment, which ended in arrest. He remained in confinement seven years, until released by James II., who, it is said, was so pleased with his comedy of *The Plain Dealer* that he ordered his debts to be paid, and added a pension of £200 per annum, which he lost at the Revolution. The succession to his father's estate, which was strictly entailed, does not appear to have relieved him from the embarrassments into which he had again fallen, and from which he found a deliverance only a few days before his death in marrying a young woman with a fortune of £1500. He died on Jan. 1, 1716. Besides the plays already mentioned he wrote poems

of no value or interest. His plays are excessively licentious (see on this and other points the article *CONGREVE*). He was a friend of Dryden, and in his later years of Pope, but Pope's statements regarding their connection are not much to be depended on. Among latest editions of his plays is that by Mr. W. C. Ward (1893).

**WYCH-HAZEL**. See **WITCH-HAZEL**.

**WYCLIFFE**. See **WICKLIFF**.

**WYCOMBE, HIGH OR CHIPPING**, a municipal borough in Buckinghamshire, 29 miles west by north from London, on the Wye, a small tributary of the Thames. The chief edifices are a large and handsome church of the thirteenth century, a grammar-school, a technical school, a girls' boarding-school (in Wycombe Abbey), &c. The making of all kinds of furniture is largely carried on, and there are paper-mills and lace-factories. In 1885 it ceased to be a parliamentary borough. Pop (1891), 13,435; (1901), 15,532; bor. since extended.

**WYE**, a river partly in Wales, partly in England. It rises on Plynlimon, in Montgomeryshire, not far from the source of the Severn, and after a circuitous and winding course, having passed through Radnorshire, Herefordshire, and separated Monmouth from Gloucestershire, it falls into the Severn below Chepstow; length, about 130 miles. It is distinguished for the beauty and variety of its scenery, especially in the neighbourhood of Tintern Abbey (which see). The tide at Chepstow rises as much as 46 feet. Large vessels cannot ascend beyond Chepstow Bridge, but barges of from 18 to 30 tons get up as far as Hereford. Other towns on the river are Monmouth, Ross, and Builth.

**WYKEHAM, WILLIAM OF**, Bishop of Winchester and Lord High-chancellor of England, a distinguished prelate of the fourteenth century, was born at Wykeham, a village in Hampshire, in 1324, of respectable parents, but so poor that, but for the liberality of the lord of the manor of Wykeham, a liberal education would have been beyond his reach. On the completion of his studies he became private secretary to the constable of Winchester Castle, and about 1347 he entered the royal service. In 1356 Edward III. appointed him to superintend the erection of Windsor Castle as surveyor of the works. Wykeham, having taken holy orders, rose rapidly to the highest dignities in church and state. In 1366 he was elevated to the rich see of Winchester, and in 1367 reached the highest point of his career, the chancellorship of England. This office he discharged with great ability nearly four years, when a party at court, opposed to the increasing wealth and influence of the clergy, succeeded in persuading the Parliament that his power was too great for a subject, and he was compelled to resign the seals (1371). In November, 1376, he was deprived of the temporalities of the see of Winchester, but soon after the accession of Richard II. (1377) he was restored to his dignities and emoluments. In 1389 he again became chancellor, and he retained the office till 1391. He is noted for having founded a grammar-school at Winchester, the famous St. Mary's College or Winchester School, which still flourishes as one of the great public schools of England; and about the same time he founded a college at Oxford, now called New College. The edifice in which the work of the college was carried on was not completed till 1386; the school buildings were opened in 1394. In the last years of his life he rebuilt Winchester Cathedral, and his tomb there may still be seen. (See *WINCHESTER*.) His death took place in 1404. See the biographies by Lowth (1758) and Moberly (1893).

**WYNTOUN, ANDREW**, an ancient rhyning

chronicler of Scotland. He was a canon regular of the priory of Saint Andrews, and was in 1395 prior of St. Serf's Inch, in Lochleven, and probably held this office till his death, which is supposed, from a passage in his chronicle, to have taken place some time after 1420. Wyntoun's Chronicle is the first historical record in the Scottish vernacular tongue. It received little attention till 1795, when David Mac Pherson published an annotated edition of that part of it which particularly refers to Scotland. David Laing, LL.D., edited a revised and enlarged edition of this work. The Chronicle begins with the creation, and contains an outline of general history and geography preliminary to the treatment of the special subject of the work. Five of the nine books of the Chronicle are taken up with this introductory matter. Wyntoun was a contemporary of Fordun, but he was unacquainted with the work of the latter; and as he survived Fordun his work is brought down to a later period. His Chronicle bears the usual character of the historical writings of the age in the indiscriminate mixture of tradition with history, but he appears to have been faithful to his authorities, whom he sometimes literally transcribes. Wyntoun's scholarship appear to have been considerable, and the candour and generosity with which he speaks of the enemies of his country, are commendable. 'His genius,' says Ellis, 'is certainly inferior to that of his predecessor Barbour; but at least his versification is easy, his language pure, and his style often animated.'

WYOMING, a state of the United States, situated between 41° and 45° north latitude, and 104° and 111° west longitude; length from east to west about 400 miles, breadth from north to south about 300 miles. It forms an almost perfect parallelogram with an area of 97,890 square miles, and is surrounded by; Montana, S. Dakota, Nebraska, Colorado, Utah, and Idaho. The surface is elevated and mountainous, the main chain of the Rocky Mountains extending across the territory from north-west to south-east.

The general height of the plains and valleys is from 3000 to 7000 feet, while the highest mountains are over 13,000 feet (Fremont's Peak, 13,790; Mount Hayden, 13,691). The chief ranges are those known as the Wind River, Teton, Big Horn, and Black Mountains or Laramie ranges. The south-eastern region is drained by the north fork of the Platte River with its tributaries, including the Laramie and Sweetwater Rivers. In the south-west is the Green River, fed by numerous affluents watering an extensive fertile tract. Flowing north are the Yellowstone, Big Horn, and Powder Rivers, while in the east a number of small streams flow towards the Mississippi. Forests cover a great part of the mountains of the state. The soil of the valleys is a fertile loam, but irrigation is necessary for the successful prosecution of agriculture, there being too little rain for the needs of the arable districts. The principal crops are wheat, oats, barley, and nearly all kinds of vegetables. There are large tracts well adapted for grazing purposes, and stock-raising is one of the principal industries. The chief minerals found are gold, copper, iron, and coal, the latter being mined to a considerable extent. The climate is severe in the mountainous regions, but mild and salubrious in the sheltered valleys. The grizzly and other bears, the panther, elk, moose, wolf, &c., are among the animals. The first settlements within the limits of Wyoming were effected in 1867, the territorial organization was completed in 1869, and the territory was erected into a state in 1890. In 1872 a section in the extreme north-west (the Yellowstone region) was set apart as a great national park (see YELLOWSTONE). The state is crossed by the Union Pacific Railway. The capital and largest town is Cheyenne. Pop. in 1870, 9118; in 1880, 20,789; in 1890, 60,705; in 1900, 92,531.

WYVERN, a charge in heraldry, representing a fictitious winged monster, like a dragon, but with only two legs and feet, which are like those of an eagle.

## X.

X, the twenty-fourth letter of the English alphabet, taken from the Latin, into which it was adopted from the Greek. The pronunciation of it in the middle and at the end of words is like that of *ks*. At the beginning of a word it has precisely the sound of *z*. The letter does not exist in Italian, but is replaced sometimes by *s*, as in *spedire*, from *expedire*; sometimes by *ss*, as in *Alessandria*; sometimes by the soft *sc*, as in *scempio*, from *exemplum*; *soiame*, from *examen*. In Spanish the letter *x* had formerly two very different sounds, one like that of *s* or *ks*, derived from the Latin, and another strongly guttural, derived from the Arabic. The latter sound is now represented in that language by *j* or (before *e* and *i* by *g*, while *x* is always pronounced like *ks* when it comes between two vowels, and like *s* in other circumstances. The Greek characters for this letter were Ξ and ξ; and the character which we now use to designate X was their guttural.

XALAPA. See JALAPA.

XANTHIPPE. See SOCRATES.

XANTHUS, anciently one of the names of a small stream in the Troad. See SCAMANDER.

XANTHUS, an ancient town of Lycia, on the river of the same name, at the distance of about

8 miles from its mouth. The inhabitants are celebrated for their love of liberty and independence. On two occasions they destroyed their city and sacrificed themselves rather than surrender to an enemy. The first was when they were besieged by Harpagus, general of Cyrus, about 544 B.C., and the second in 43 B.C., when they were besieged by Brutus in the civil war following the death of Cæsar. After this the city was not rebuilt. Its ruins were discovered in 1838 by Sir Charles Fellows; and many valuable remains obtained from it are now preserved in the British Museum.

XAVIER, ST. FRANCIS, a celebrated Spanish missionary, surnamed the *apostle of the Indies*, and one of the first disciples of Ignatius Loyola, was born April 7, 1506, in the castle of Xavier in Navarre, at the foot of the Pyrenees. He studied at the college of St. Barbe, in Paris, and taught philosophy in the college De Beauvais, in the same city, at the time when Ignatius Loyola entered this college to resume his studies. Loyola was already occupied with his plan of establishing a society (the Society of Jesus) for the conversion of infidels, and succeeded in inducing Xavier to take part in it. In 1534 Xavier, with the other six original members of the society,

took the vows of poverty and chastity, to which they added that of making a pilgrimage to the holy sepulchre, and of devoting themselves to the conversion of infidels. In case of failing in this attempt they were to do such service to the church as the pope should direct. When John III., king of Portugal, desirous of propagating the Christian faith in his Indian possessions, requested of Ignatius Loyola a suitable missionary, Xavier agreed to undertake the office. Early in April, 1541, he embarked at Lisbon, and in May, 1542, arrived at Goa. According to the custom which he always followed, he took lodgings in the hospital, where he spent his leisure time in attending on the sick. He preached, and converted to Christianity many heathens, Jews, and Mohammedans there, and on the coast of Comorin, at Travancor, Macassar, in the Molucca Islands, Malacca, Ceylon, Cochin, and, in 1548, returned to Goa, where a college of Jesuits had been established. Thence he went to Japan in 1549, where he laboured till near the end of 1551, when he left Japan with the intention of preaching Christianity in China. But he never reached his destination. He died on the voyage near Macao on the 2d of December, 1552. It may be mentioned as a singular coincidence that in this year, Matteo Ricci, the apostle of the Chinese, was born. The remains of Xavier were in 1554 removed to Goa, and deposited in St. Paul's Church. Many miracles having been ascribed to Xavier, he was beatified by Paul V. in 1619, and canonized by Gregory XV. in 1622. His extant works are Five Books of Epistles, a Catechism, and Opuscula. The life of Xavier has often been written. That of Turcellinus in Latin (Rome, 1594) is one of the best. See *The Missionary Life and Labours of Fr. Xavier* by Henry Venn (1863); *De Vos's Leben und Briefe* (two vols., 1877); *H. J. Coleridge's Life and Letters* (two vols., 1872-73); *Mary McLean's Life* (1896).

**XEBEC**, a small three-masted vessel, formerly much employed by the Algerine pirates, and still used in the Mediterranean, distinguished from other European vessels by the great projection of the prow and stern beyond the cut-water and stern-post. In this respect it resembles the felucca, from which it differs only in having the fore-mast square-rigged. The xebec is constructed with a narrow floor for the sake of speed, and of a great breadth, so as to be able to carry a considerable force of sail without danger of overturning. The xebecs which the Algerines used carried from 300 to 450 men, two-thirds of whom were commonly soldiers. They had from sixteen to twenty-four cannon.

**XENOCRATES**, an ancient philosopher, born in Chalcedon in 396 B.C., and educated in the school of Plato, whose friendship he gained. Though of a dull and sluggish disposition, he supplied the defects of nature by unwearied attention and industry. Plato esteemed him much; but his want of polished manners often called forth his teacher's advice to sacrifice to the Graces. He travelled with Plato to Sicily, and after his death went with his fellow-scholar Aristotle to Asia Minor, but soon returned. He succeeded Speusippus in the school of Plato about 339 B.C. His integrity was so well known, that it is said that when he appeared in the court as a witness the judges dispensed with his oath. He died in 314 B.C., after he had presided in the Academy for above twenty-five years. He was the author of numerous works, none of which, however, are extant.

**XENOPHANES**, a Greek philosopher and poet, celebrated as the founder of the Eleatic school. He was a contemporary of Pythagoras and Anaximander (second half of the sixth century B.C.). Having been banished from his native city of Colophon, he went to Sicily, and thence to Magna Græcia. He settled,

about 536 B.C., at Elea (Velia), from which place his system, and the school which he founded, derive their name. Of his poems, in which he treated of philosophical and other subjects, we have only fragments contained in the works of Athenæus, Plutarch, and others. The fragments of his didactic poem, *Peri physcōn* (on Nature) have been collected by Brandis in his *Commentationes Eleaticæ* (Altona, 1813), and by Karsten in his *Philosophorum Græcorum veterum reliquæ* (vol. i. Brussels, 1830). See **ELEATIC**.

**XENOPHON**, a celebrated ancient Greek historian and general, born at Athens, probably about 445 B.C. He lived during a period in which the greatest political and intellectual excitement existed at Athens, and in which the most distinguished men, of whom he was one, appeared on the stage. Xenophon was a favourite disciple of Socrates. He fought together with his teacher in the Peloponnesian war, and had his life saved by Socrates in the battle of Delium, in 424 B.C. When the Persian prince, Cyrus the Younger (so called in contradistinction to the founder of the monarchy), contended with his elder brother Artaxerxes Mnemon for the throne, the Lacedæmonians sent him auxiliaries, among whom Xenophon served as a volunteer. He became a favourite of Cyrus, who was defeated and lost his life on the field of Cunaxa (401 B.C.). The principal officers of the auxiliary army having been likewise killed in battle, or taken prisoners by artifice, and then put to death, Xenophon was selected to command the Greek forces, 10,000 men strong. They were in a most critical situation, in the midst of a hostile country, above 2000 miles from home, without cavalry, surrounded by enemies and innumerable difficulties; but Xenophon was able to inspire them with confidence, to repress insubordination, and to lead them home to Europe. They marched 1155 parasangs, or nearly 4000 miles, in 215 days. Xenophon himself has described this retreat, and at the same time the whole expedition of the younger Cyrus, in his *Anabasis*. On their arrival in Europe (at Byzantium) a number of the troops, with Xenophon at their head, entered the service of Seuthæ, king of Thrace; but when Seuthæ kept back part of their pay Xenophon recrossed with his troops into Asia Minor, and joined the Spartan general Timbron or Thibron, who was then conducting the war against the Persian satraps Pharnabazus and Tissaphernes. It was perhaps about this time that the sentence of banishment was passed upon him by his native city for joining the expedition of Cyrus, who was considered a friend of Sparta and an enemy of Athens. There is no reason to believe that Xenophon left Asia Minor before 394, when he returned to Greece with Agesilaus, king of Sparta, after his expedition against the Persians. In that year he fought on the side of the Spartans against the Athenians at Coroneia. After that he settled at Scillus, a small town in the neighbourhood of Olympia, in Elis. In this solitary retreat he dedicated his time to literary pursuits; and as he had acquired riches in his Asiatic expeditions, he began to adorn the country which surrounded Scillus. He built a magnificent temple to Artemis in imitation of that of Ephesus, and spent part of his time in rural employments, or in hunting in the woods and mountains. He does not appear ever to have returned to Athens, although the sentence of banishment passed on him was afterwards repealed. He remained for about twenty years at Scillus, but was ultimately expelled from it by the Eleans. Thereupon he seems to have retired to Corinth, and to have died there at a very advanced age; it is said about ninety. He is known to have been still living seventy years after his life was saved by Socrates. Besides the *Anabasis*, Xenophon was the author of the *Apo-*

*mnemoneumata*, more commonly known as the *Memoabilia Socratis*, in which there is no doubt that we have a faithful representation of one side of the Socratic teaching; the *Cyropædia*, in which, under the guise of a life of Cyrus the Elder, there is an exhibition of Xenophon's views respecting the best form and methods of government; the *Symposium* (*Banquet*), in which Socrates is brought before us under his social aspect; and of several minor works on hunting, agriculture, politics, and the science of war. The style of Xenophon is in general a model of elegant simplicity. He is therefore one of those classics which are particularly selected for the instruction of youth, though his philosophical works are not proper for beginners. The Greeks esteemed his merit as a writer so high that they called him the 'Attic bee' and the 'Attic muse.' His works have been often published separately and together. The best editions of the complete works of Xenophon are by Schneider (new edition partly by Bornemann and Sauppe, six vols., 1805-49), Dindorf (1839), Sauppe (1865-66), and Schenkl (1869 onwards). There is a complete English translation by H. G. Dakyns, with introductions, notes, &c. (four vols., 1890 onwards).

**XERES** (or **JEREZ**) **DE LA FRONTERA**, a town of Spain, in the province of Cadiz, on the Guadalete, 15 miles N.W. of Cadiz, in a beautiful and fertile plain. Its manufactures are unimportant; but the trade, of which the staples are corn and wine, is very important. The wine is chiefly exported to Britain, where it is known under the name of sherry. Near this town a battle was fought between the Moors and Goths in 711, in which Roderick, the last king of the Goths in Spain, lost his life. Pop. (1897), 60,004.

**XERXES I.**, King of Persia, famous for his unsuccessful attempt to conquer Greece, was the second son of Darius the son of Hystaspes, and began to reign in 485 B.C. He was preferred to his brother Artabazanes, who had been born before his father was raised to the throne; while Xerxes was born after that event, and was the son of Atossa, daughter of Cyrus. This preference caused no struggle between the brothers. After having subdued Egypt (which had revolted) in a single campaign, he thought himself able to execute the plan of conquering Greece, which had been already conceived by his father. He collected for this purpose an immense army. The historians estimate it at 1,000,000 men. In all probability the Greeks greatly exaggerated the number of their enemies; and the train of women and slaves who followed the army made at least half of its numerical amount: still the numbers of the Persians were beyond all comparison superior to those of the Greeks. By means of a bridge of boats Xerxes crossed the Hellespont (480). The Greeks awaited their enemy on the frontier of their country, in the pass of Thermopylæ. After the heroic Leonidas had fallen with his Spartans (see **LEONIDAS**), Xerxes pressed forward and burned Athens, which had been forsaken by its inhabitants. The first naval battle between the two powers at Artemisium had been indecisive; but it inspired the Greeks with new confidence; and the second naval action at Salamis, in which, if we believe the Greek historians, 2000 Persian vessels were engaged against 380 Greek, terminated in the defeat of the Persians (Sept. 480). Xerxes now quitted Greece, leaving behind him his best general, Mardonius, who, not long after, was entirely beaten at Plataea. Xerxes himself returned from his expedition in the most humiliating manner. The bridge of boats over the Hellespont had been destroyed, and he passed the strait in a small fishing-boat. He now gave himself up to debauchery; his conduct offended his subjects, and Artabanus, the captain of his guards, conspired

against him, and murdered him in his bed, in the twenty-first year of his reign, about 465 years before the Christian era. (See **GREECE—History**, **ARISTIDES**, **MILTIADES**, **PAUSANIAS**, **THEMISTOCLES**, &c.) The personal accomplishments of Xerxes have been commended by ancient authors; and Herodotus observes, that there was not one man among the millions of his army that was equal to the monarch in comeliness or stature, or that was as worthy to preside over a great and extensive empire.

**XIMENEZ**, **FRANCISCO**, Cardinal, Archbishop of Toledo, and prime minister of Spain, was born in 1437, at Torrelaguna, a small village in Old Castile, where his father was a lawyer. He studied at Salamanca, travelled afterwards to Rome, and obtained a Papal bull, which secured to him the first vacant benefice in Spain. The Archbishop of Toledo refused to give him any place; and, Ximenez having manifested irritation upon this refusal, he caused him to be imprisoned. Ximenez, nevertheless, recovered his freedom, and the Cardinal Gonzalez Mendoza, bishop of Sigüenza, appointed him his grand-vicar. He afterwards (about 1482) entered the Franciscan order, and for several years lived a hermit's life, practising the most rigid asceticism. In 1492 he became father confessor to Queen Isabella of Castile, to whose notice he had been recommended by Cardinal Mendoza. In 1495 he was made Archbishop of Toledo. He did not accept this dignity till after many refusals, and an express command from the pope. As an archbishop he was very zealous, behaving as a father towards the poor, abolishing a multitude of abuses, and adhering steadfastly to his resolution that the public offices should be filled with honourable and well-qualified men. He gave excellent rules to the clergy of his diocese, and in spite of all opposition effected a reform in the mendicant orders of Spain, founded in 1499 a university at Alcalá de Henares, and undertook, some years after, an edition of the Old Testament in six languages. (See **POLYGLOT**.) Before this, in 1514, he had published at Alcalá an edition of the New Testament in the original tongue. His activity was also displayed in other ways. Dissensions prevailed in the royal family. Philip of Austria, son of the Emperor Maximilian I., had married Joanna, the only daughter of Ferdinand and Isabella. After the death of the latter Philip received the Kingdom of Castile, in right of his wife, the sole heiress of her mother. This gave rise to disputes between him and his father-in-law, which were composed by Ximenez. After Philip's early death (1506) Ferdinand became regent of Castile for his grandson, afterwards the Emperor Charles V., who was a minor. On this occasion he had been much assisted by Ximenez. In 1507 Ximenez received from the pope the cardinal's hat, and was appointed grand-inquisitor of Spain. The conversion of the Moors, and the plan of wresting some provinces from these unbelievers, now particularly occupied his attention. With this view he formed the project of passing over to Africa, in order to take the fortress of Oran, which was in the possession of the Moors. He applied the income of his archbishopric (300,000 ducats), the richest in Europe, to this purpose. A mutiny which arose among a part of his troops, who disliked the idea of having a clergyman for their leader, he suppressed immediately by strict measures. In May, 1508, he landed on the coast of Africa. In the dress of an archbishop, over which he wore a suit of armour, surrounded by priests and monks, as if in a religious procession, he led the land forces. A battle soon followed in the neighbourhood of Oran, in which the Moors were defeated. The fortress was immediately taken and the garrison put to the sword. Ximenez caused Oran to be fortified anew, changed the mosques into churches, and



then returned as a conqueror to Spain, where Ferdinand received him with much pomp. When the latter died in 1516, his grandson Charles being still a minor, Ximenez became regent of Spain, and effected many important changes during his regency, which continued only two years. He brought the finances into order, paid the crown debts, and restored the royal domains which had been alienated. He humbled the Spanish nobility, who hated him on account of his severity. He caused the laws to be observed, and placed the Spanish military force upon a respectable footing. He was dismissed by Charles

on 1st September, 1517, and died at Toledo on the 8th November of the same year.

XIPHIAS. See SWORD-FISH.

XIPHOSURA ('Sword-tailed'), the name of an important order of Crustacea, represented by the King-crabs (which see) or Limuli, in which the last joint of the tail or *telson* exists as a long spinous process.

XYLOPHAGA, a genus of Lamellibranchiate Mollusca, belonging to the family Pholadidæ, and noted, like the other members of that group, for its habits of burrowing into stones. See PHOLAS.

## Y.

Y, the twenty-fifth letter of the English alphabet, sometimes used as a vowel, sometimes as a consonant. It is a consonant when it comes before a vowel, in which cases it is produced by the emission of breath, whilst the middle part of the tongue is brought into contact with the roof of the mouth. It may also be described as produced by sounding *ee* rapidly before the following vowel, and throwing the stress of the voice on that vowel; thus, *you* is pronounced *ee-do*. The letter *y* is derived from the Greek *Y* or *υ*, which, however, had a different sound. The Romans retained the Greek *y* in nouns originally Greek and betraying a Greek origin, as *physica*, *mythos*, *synodus*, *Harpyia*, *systema*, *Libya*, *myrrha*, *mysterium*; and probably pronounced it like the Greek *υ*, or the French *u*, or the German *ü*. Y, on the French coins, denotes the mint of Bourges. Y, in its Greek form (*Υ*), is also called the *Pythagorean* letter, because the Pythagoreans were said to signify by it the proceeding of the *dyad* out of the *monad*, or the sacred *triad*.

Y, or IJ, an inlet of the Zuider Zee, on which Amsterdam is situated, now in great part drained and converted into agricultural land, the remaining portion being connected with the North Sea by a great ship canal entering the sea at the port of Ymuiden (Ijmuiden). See AMSTERDAM.

YACHTS AND YACHTING. The term yacht is not easily defined, for it is now applied to vessels of widely different size and build, propelled either by means of sails or by steam, electricity, or other similar power, and used for many different purposes, such as racing, cruising, exploration, state ceremonial, &c. Sailing yachts may be of any rig suited to their size, chiefly cutters, schooners, ketches, yawls, and luggers.

*History.*—The word *yacht* is of Dutch origin, being from Dutch *jagt*, a swift vessel, from *jagen*, to chase, to hunt. It seems to have been introduced into England in 1660 when the Dutch presented Charles II. with a yacht. The first recorded yacht race was that between Charles II. and his brother the Duke of York (afterwards James II.), which took place on the Thames in 1661, but from that date none is on record till 1796, when ten boats started on a fifty-mile race in the Bristol Channel under the auspices of the Bristol Sailing Society. Yacht-racing is a characteristic development of the nineteenth century, especially of its latter half. For a long period, extending well into the nineteenth century, yachting was closely connected with naval defence, and private yachts were generally constructed to carry guns and be used in case of need for naval purposes. Private individuals of means were thus able to contribute to national defence not

only directly by forming a kind of minor volunteer fleet, but also indirectly by leading the way in the development of naval architecture. In 1832 the *Emerald*, the fastest cutter in the Royal Navy, was defeated in a racing and sailing contest with the *Paddy from Cork*, a yacht belonging to a member of the famous Water Club of Cork, and in consequence the head of the government school of naval architecture in Portsmouth was deputed to measure several private yachts with a view to improving the construction of vessels for the navy. In the following year the *Water Witch*, a vessel similar to the ten-gun brigs of the navy, built for Lord Belfast, proved herself faster than any vessel in the Royal Navy and better than any of her kind for purposes of warfare. Of the many yacht clubs now in existence only the Royal Cork Yacht Club and the Royal Thames Yacht Club can trace their history back to a period before last century. The origin of the former, for long called the Water Club of Cork Harbour, is unknown, but it was reorganized in 1720. About 1765 it almost ceased to exist, but 1806 witnessed a revival. In 1828 its name was changed to Cork Yacht Club, and since 1831 it has been styled Royal. The Thames Club was first established as the Duke of Cumberland's Fleet in 1775, but in 1821 the name was changed to His Majesty's Coronation Sailing Society. A secession which took place in that year led to the formation of the Thames Yacht Club, which alone survives, and which received the title Royal in 1830. The premier yacht club of the United Kingdom, the Royal Yacht Squadron, with head-quarters at Cowes, dates back to 1815 in its formal capacity. In 1820 it became the Royal Yacht Club, and in 1833 its name was changed by royal order to Royal Yacht Squadron. The Royal Northern Yacht Club, with head-quarters at Rothesay, was founded in 1824. The oldest of the remaining clubs, numbering altogether about 120, of which about one-third are Royal, are: Royal Western of England (Plymouth), founded in 1827; Royal Eastern (Firth of Forth), founded 1836; Royal London (London and Cowes), founded as the Arundel Yacht Club in 1838; Royal St. George (Kingstown), founded 1838; Royal Harwich (Harwich), founded 1843; Royal Southern (Southampton), founded 1843; Royal Mersey (Liverpool), founded 1844; Royal Victoria (Ryde), founded 1844; Royal Irish (Kingstown), founded 1846; Royal Engineers (Chatham), founded 1846; Royal Welsh (Carnarvon), founded 1847; Royal Yorkshire (Hull), founded 1847; and the Royal Clyde (Hunter's Quay), founded 1856, said to be the largest in the world. Of Corinthian yacht clubs

formed for the development not only of yachting but also of amateur seamanship on board yachts, the oldest is the Orwell Corinthian Yacht Club, founded in 1830. Other leading clubs of this kind are the Mudhook (Hunter's Quay); Clyde Corinthian (Hunter's Quay), founded 1846; Royal Alfred (Kings-town), founded 1864; Royal Corinthian (Port Victoria), founded in 1872; Royal Plymouth Corinthian (Plymouth), founded 1877; and the Royal Portsmouth Corinthian (Portsmouth), founded in 1880. The Cruising Yacht Club, as its name implies, belongs to a different class from the above.

**Racing Yachts.**—The designing and construction of a racing yacht require no small amount of scientific and technical knowledge besides large experience, and consequently the yachts entered for the leading races, at least in the higher classes, are the work of a very few designers and builders. In a yacht intended for racing, speed is the primary essential, and to it accommodation and convenience are in large measure sacrificed. Moreover, a designer has to take into account the circumstances under which his vessel is to be run, or the competitors which she has to meet, because a yacht that does well in fine weather and a smooth sea will usually be of little account in boisterous weather and a rough sea. The rating rules of the Yacht Racing Association (formed in 1875) also condition the designer's work, and it will be necessary, therefore, to give some account of them here. The object of rating regulations is to secure that all competitors shall start on practically even terms in any given race, and this is achieved by the classification of yachts in well-defined groups according to certain measurements, and also, especially among large yachts, by means of time allowances corresponding to differences in these measurements. In the early days of racing, yachts were grouped according to tonnage, the tonnage being determined, as for other vessels at that time, by multiplying the length by the breadth and the depth and dividing by 96 (afterwards 94). This was replaced by what is called builder's measurement or old measurement, which is still in use for some purposes connected with yachts. The formula for tonnage according to this system is  $\frac{(L - \frac{1}{2}B) \times B \times \frac{1}{2}B}{94}$ , where  $L$  and  $B$

denote length and breadth respectively. The Thames measurement rule, introduced in 1854, made tonnage equal to  $\frac{(L - B) \times B \times \frac{1}{2}B}{94}$ ; but in 1881 the

Yacht Racing Association introduced the 1730 rule, according to which tonnage was equal to  $\frac{(L \times B)^2 \times B}{1730}$ .

These rules were found to have the effect of encouraging the construction of yachts of very narrow beam, especially after about 1871, when designers learned the use of outside ballast on the keel. A great change was effected in 1886, when the length-and-sail-area rule came into force, and yachts were classified according to rating determined by the formula  $\frac{\text{Length} \times \text{Sail Area in sq. ft.}}{6000}$ . The present

linear rating rule was adopted in 1896, but it cannot be said that finality has yet been reached. Linear rating is expressed in feet, and is determined by the formula  $\frac{\text{Length} \times \cdot 75 \text{ Girth} \times \cdot 5 \sqrt{\text{Sail Area}}}{2}$ .

The relation of the classes under the 1881, 1886, and 1896 rules may be shown as follows: 18 feet linear rating =  $\frac{1}{2}$  rating (length and sail area); 24 feet = 1 rating; 30 feet =  $2\frac{1}{2}$  rating; 36 feet = 5 rating = 3 tons; 42 feet = 10 rating = 5 tons; 52 feet = 20 rating = 10 tons; 65 feet = 40 rating = 20 tons.

For the smaller vessels wood is the cheapest and

lightest material, but larger ones are made of steel, or of steel frames with a wooden skin, the latter class being called composite. Other metals, notably aluminium, have also been used for the construction of yachts. Practically all large composite vessels, and also many small ones, have a copper sheathing to protect the submerged parts of the wood from the action of the water. The sails of racing yachts are generally made of cotton, mostly the finest Egyptian variety; but ramie fibre is coming into use for this purpose, and a mixed cotton and ramie material is also in use. Up till a comparatively recent date flax was generally used for the sails of racing yachts, though it does not produce a sufficiently smooth and close-textured cloth.

The speed of a racing yacht of given size may be regarded as the result of a compromise between stability, which determines sail-carrying power, and resistance. The stability depends upon well-known hydrodynamic principles, and may be roughly said to be determined by breadth of beam, the lowness of the centre of gravity of the vessel, and the quantity and position of the ballast. Resistance at low speeds is due chiefly to surface or skin friction, but at higher speeds it is principally caused by wave-making, a phenomenon too intricate to be discussed here. An increase in beam increases stability, but at the same time increases skin friction. Wave resistance is less in vessels whose displacement is obtained mainly by breadth than in those where displacement is principally determined by depth. Various means of lowering the centre of gravity have been adopted with advantage, such as the use of hollow masts and booms, the use of aluminium for the upper part of the vessel's sides, &c. Stone ballast was used in the early days of yachting, but it was superseded by iron, and that in turn by lead. The lead ballast was afterwards carried on the keel, and, later, the keel consisted of a plate of lead projecting far below the hull. At present the deep fin-keel is of some other metal than lead, and carries the lead at its base in a cigar-shaped bulb. Surface friction is lessened by making the submerged surface smooth, either by coating it with varnish, or by covering it with polished metal, or in some similar way. The chief names in the evolution of the present shape or lines of yachts from the old 'cod's head and mackerel's tail' varieties are those of Scott Russell and John Hyslop, the latter an American. The curve of cross sections for the forepart should be nearly a curve of versed sines, and that for the hinder part a trochoid; but various considerations may modify these theoretical forms. If two vessels differ in nothing but length, the longer will be the faster. The centre-board keel, consisting of a plate of iron which can be raised or lowered according to circumstances, was of British invention, but is now most characteristic of American racing yachts.

The ordinary rules of the road at sea apply in the main to yacht-racing. Yachts sailing with the wind free must clear those sailing close-hauled. Yachts on the port tack must give way to those on the starboard tack, and an overtaking yacht must clear the overtaken vessel. The start in a yacht race is now always a flying one, but prior to about 1860 yachts started from anchor. Frequently much depends upon the start, and accordingly manoeuvring for initial position is of considerable importance. At the start, as throughout the race, the skipper counts for a good deal. The course to be traversed is marked out by buoys, light-ships, or flag-boats. The time allowances corresponding to differences in rating are determined in accordance with a scale prepared by the Yacht Racing Association. Vessels always start together, the time allowance being

made at the end of the race. Handicapping is also practised to some extent in yacht-racing.

**Leading British Yachts and Races.**—Among pioneer British yachts of the first half of the nineteenth century the most notable were the *Menai*, in which the hollow bow was first introduced; the *Mosquito* (1848), an iron vessel built on the Thames in accordance with Mr. Scott Russell's theories; and the *Tiara*, built at Renfrew in 1850. The visit of the *America* from the United States in 1851 marked an epoch in British yachting. She was a schooner of 208 tons, and entered along with fourteen other vessels for a race round the Isle of Wight. Five of the vessels were schooners, nine were cutters, the remaining one being a bark (*Brilliant*), and though they varied in tonnage from 47 (*Aurora*) to 393 (*Brilliant*) no time allowance was given. The *America* won the race and the cup presented by the Royal Yacht Squadron, the *Aurora* coming second, eighteen minutes behind. In 1857 the cup was set aside by the owners of the *America* as a perpetual international challenge trophy. This was the origin of the contests for the so-called America Cup, for which see the next section. The victory of the new-comer secured the triumph of the views represented in the *Mosquito* and the *Tiara*, and revolutionized the practice of British yachtsmen. For about a quarter of a century the schooner was the popular form of racing yacht, among the most notable being *Cumbria* and *Miranda*. Gradually, however, the schooners were displaced by cutters and yawls. The more famous of the early racing cutters were *Kriemhilda*, *Oimara*, *Cythera*, *Vol-au-Vent* (1875), and *Neva* (1876); and the leading yawls of that period were *Florinda* (1873) and *Jullanar* (1877). *Formosa*, a big cutter built in 1878, was supreme in her class till 1880, when Mr. G. L. Watson's first large yacht, the *Vanduaara*, came on the scene. Another famous designer, Mr. Fife, scored a great success with the 40-ton yacht *Anasona*, which began to compete in 1881. *Marjorie*, from Watson's lines, a vessel of 68 tons, was the chief new cutter of 1883; and to the following year belong *Irex*, designed by Mr. Richardson, and *Genesta*, an America Cup competitor designed by Mr. Beavor Webb. The *Galatea*, another cup challenger, was a complete failure in home waters in 1885; but the challenger of 1887, *Thistle*, from Watson's design, met with great success before crossing the Atlantic. *Thistle* was the first large yacht constructed under the length-and-sail-area rule. *Varana*, another Watson boat, was the chief novelty of 1888, and in 1889 the same designer produced *Valkyrie I.* for Lord Dunraven. The old *Irex* continued racing with considerable success down to 1889, and was succeeded in 1890 by *Iverna*, by the same designer. In the latter year *Thistle* reappeared, and thus the leading yachts of that season were *Varana*, *Valkyrie I.*, *Thistle*, and *Iverna*. These were rated at 60, 77, 121, and 118 respectively. The *Valkyrie I.* was ultimately sold to an Austrian archduke, and the *Thistle* to the German Emperor, who renamed it *Meteor*. The years 1891 and 1892 were chiefly remarkable for smaller vessels, such as Watson's *Queen Mab* and *Varana* and Fife's *Thalia* and *Lais*; but 1893 was rendered memorable in the annals of yachting by fine contests between *Valkyrie II.*, designed by Mr. Watson for Lord Dunraven, *Britannia*, designed by Watson for the Prince of Wales, *Satanita*, *Calluna*, and *Narwhale*, an American yacht designed by Mr. Herreshoff. *Valkyrie II.* proved to be the best of these cutters, but *Britannia* was a good second. In 1894 these yachts competed with *Vigilant*, a Herreshoff vessel which had defeated *Valkyrie II.* in the contest for the America Cup. *Valkyrie II.* was

sunk by *Satanita* in the Clyde while manoeuvring for a start, but *Britannia* repeatedly beat the *Vigilant*. The *Ailsa*, from lines by Mr. Fife, jun., and the *Valkyrie III.*, designed by Mr. Watson for Lord Dunraven, appeared in 1895. The third *Valkyrie* went to America to contest the cup, and the honours at home fell to *Britannia* and *Ailsa*, especially the former. Mr. Fife, however, scored in the 40-raters with *Isolde*, which was distinctly better than Mr. Watson's *Caracas*. A new *Meteor*, designed by Mr. Watson for the German Emperor, competed in 1896 against *Britannia* and *Ailsa*, the result for the season being: *Ailsa* (60 starts, 21 firsts), *Britannia* (58 starts, 14 firsts), *Meteor* (22 starts, 13 firsts). The principal first-class cutters since that date are: *Bona*, by Watson (1897), for the Duke d'Abruzzi; *Shamrock I.*, built for Sir Thomas Lipton to contest the America Cup in 1899; and *Shamrock II.*, built for Sir Thomas Lipton to contest the America Cup in 1901.

**American and International Yachting.**—The oldest yacht club of the United States is the New York, which was started in 1844, and held its first regatta in 1845. The number of yacht clubs in the Union is now very large, and they have been formed not only on the sea-coasts but also on the large lakes. The *Jefferson*, built in 1801, is regarded as the first yacht built in America, but the first American yachts of importance were those designed by George Steers, notably the *America* (see above). In 1866 three American yachts, *Henrietta*, *Flectwing*, and *Vesta*, raced across the Atlantic, the first-named winning the race with a time of 13 days, 21 hours, 55 minutes. In 1870 the English yacht *Cambria*, which had challenged for the America Cup, beat the American *Dauntless* in a transatlantic race, but she was beaten by the *Mayfin* and several other boats in the race for the cup. In 1873 Mr. Ashbury, who owned the *Cambria*, again challenged for the cup, but his yacht *Livonia* was defeated by the New York Club's vessels *Columbia* and *Sappho*. Major Charles Gifford, a Canadian, challenged for the America Cup in 1876 with the *Countess of Dufferin*, but his yacht was beaten by the defender *Madeline*. Another Canadian vessel, the *Atlanta*, contested the cup in 1881, her opponent being the *Mischief*, but the result was the same as before. Sir Richard Sutton sent the next challenge in 1885, and his yacht *Genesta* was pitted against the *Puritan* but without success. The *Puritan* was designed by Mr. Edward Burgess, as was also the *Mayflower*, which successfully defended the cup against the English *Galatea* in 1886. The *Thistle* met another Burgess boat, the *Volunteer*, in the same contest the following year, but, like all preceding challengers, she failed to gain the cup. Mr. Herreshoff scored his first great success as a designer with *Gloriana* in 1891, and soon afterwards he produced the *Vigilant*, which defeated *Valkyrie II.* in the America Cup contest of 1893. The cup contest of 1895 between Lord Dunraven's *Valkyrie III.* and the American *Defender* had an unsatisfactory result. Two races were awarded to the latter on purely technical grounds, and in consequence Lord Dunraven withdrew from the competition. In the same year a Canadian yacht named *Canada* defeated the United States yacht *Vancedor* in a competition for an international cup. The next challenges for the America Cup came from Sir Thomas Lipton, whose yachts *Shamrock I.* and *Shamrock II.* were beaten by the American *Columbia* in 1899 and 1901 respectively. Sir Thomas again challenged for the cup in 1902, and the races will take place in 1903.

Ocean cruising in steam and sailing yachts, ice-yachting, and other branches of yachting in its

widest sense can only be mentioned here. For information regarding them, and for fuller details concerning the qualities and performances of racing yachts, the reader is referred to the articles by Lord Dunraven and others in the *Encyclopedia of Sport* (1898). See also the *Badminton Library* volumes on Yachting (two vols., 1894) by Lords Pembroke and Dufferin; *Yacht Architecture* (1885) and other works by Dixon Kemp; *Steam Yachts and Launches* (1888) and other works by C. P. Kunhardt; &c.

YAK. See Ox.

YAKUTSK, a town of Eastern Siberia, capital of the government of same name, on a plain surrounded by lofty heights, on the left bank of the Lena. The streets present a singular aspect, being composed of houses of European structure, standing apart, while the intervening spaces are occupied by winter *yurts* or huts of the northern nomads, with walls of cow-dung, earthen roofs, and doors covered with hairy hides. The principal buildings of the town are a large stone cathedral, other churches, a synagogue, a market-house, and several educational institutions. The trade is important, Yakutsk being the chief commercial emporium for the whole of Eastern Siberia. The principal articles of native produce are furs and fossil ivory, which are exchanged for European produce. Important fairs are held. Pop. in 1897, 8534.—The government of Yakutsk has an area of 1,617,696 square miles, or about two-fifths of that of Europe. The surface is generally low in the north, but rises towards the interior, and in the south and east is covered by the Yablonoi or Stanovoi mountains and their offshoots. A noteworthy feature of the country is the immense boggy plains which stretch along the north and are called *tundras*. Farther south there are good pastures, and wheat and rye are successfully cultivated, even where the ground is frozen to a depth of 600 feet, the summer heat being strong enough to thaw it sufficiently deep for cultivation. There are a number of large rivers teeming with fish, the principal being the Lena. There are valuable forests in the south, frequented by numerous fur-bearing and other animals. The towns are chiefly inhabited by Turks and Cossacks, but the great body of the people are nomads, consisting of Yakuts, Tunguses, &c. Pop. (1897), 261,731.

YALE COLLEGE. See NEW HAVEN.

YAM (*Dioscorea sativa*), a slender herbaceous twining plant of the natural order Dioscoreaceae, having large tuberous root-stocks which are much used for food in Africa and the East and West Indies. They are mealy, and esteemed to be easy of digestion, are palatable, and not inferior to any tuber now in use, either for delicacy of flavour or nutriment. They are eaten either roasted or boiled, and the flour is also made into bread and puddings. The juice of the root-stocks, when fresh, is acid, and excites an itching on the skin. There are many varieties, some having tubers spreading out like the fingers; others twisted like a serpent; others, again, very small, scarcely weighing more than a pound, with a whitish, ash-coloured bark, whereas the bark is usually black. The flesh of the yam is white or purplish, and viscid, but becomes farinaceous or mealy when cooked.

*D. aculeata*, by some considered only an improved variety of the preceding, is universally cultivated in the East and West Indies, in Africa, and in all the islands of the Pacific. The roots are frequently 3 feet long, and weigh 30 lbs. All the varieties are propagated like the potato, but they arrive much sooner at maturity. The buds of the root-stocks are not apparent; but still a small piece of skin is left to each set, for from this piece of bark alone the shoots proceed. Holes are made in rows 2 feet apart, and 18 inches distant in the row: into these holes two or

three sets are put, first covered with earth, and then with a little haulm or rubbish, to retain moisture. The only after-culture consists in hoeing up the weeds. They are commonly planted in August, and are ripe about the November or December following. When dug up the greatest care is taken not to wound them, as that occasions them to sprout much earlier than they would otherwise. An acre of ground has been known to produce from 20,000 to 30,000 lbs. weight. The species of *Dioscorea* are all twining plants, bearing, usually, heart-shaped and strongly-nerved leaves, and inconspicuous flowers. The Chinese Yam (*D. batatas*) is cultivated in Great Britain, and when properly boiled is held in esteem by many.

YANG-TSE-KIANG, the name generally given by European geographers to one of the greatest rivers of China throughout its entire course, although this name is only applied in China to the lower course of the river, the entire river being called simply Kiang, or Ta Kiang (river or great river), while in the various provinces it traverses it is generally known by special names. It rises in the highlands of Tibet, about 35° N. lat. and 89° E. long., and is first known by the name of Muru-Ussu. In its upper course it is sometimes called the Kin-cha-kiang. Its upper course through the mountainous region of Tibet extends to about 1100 miles, during which its windings and falls must present innumerable striking scenes of natural beauty. It crosses the Chinese frontier in the province of Yunnan. Between the town of Li-kiang-foo in this province, and Hoi-li-choo in Szechuen, for a course of about 250 miles, it flows in an easterly direction through a winding channel or mountain gorge of imposing grandeur. Traversing the whole province of Szechuen in a north-easterly direction, and passing in south-easterly direction into the province of Houpe, it reaches at Kin-chow-foo the great Chinese plain, and traversing the provinces of Nganhoei and Kiangsoo, and passing the cities of Han-Yang, Hankow and Wuchang, a great seat of the tea-exporting trade, Ngan-king-foo, Nanking, and Chin-kiang, it enters the Tonghai or Eastern Sea above Shanghai. Its direct course from its source to its mouth is estimated at 1800 miles; its course with windings is about or considerably over 3000. It receives numerous affluents, and is crossed by the Grand Canal, which forms a junction between it and the Hoang-ho. The river and the ports of Chin-kiang and Hankow were opened to foreign navigation in 1860, Ichang (1000 miles up), and others since. A British squadron sailed up the river in 1861 for more than 800 miles. The navigation above the confluence of the Tung-ting is interrupted by rapids. The tidal influence reaches in February to Lake Po-yang, 436 miles from the sea.

YANINA. See JANINA.

YANKEE, a name commonly supposed to have been derived from the Indian pronunciation of the word *English*, or of the French *Anglais*. It was originally applied in America to the inhabitants of the New England States, but has since become more general. By the rebels in the war of 1861–65 it was applied generally to the inhabitants of the Northern States, and by foreigners it is often applied to the inhabitants of the States generally.

The air of Yankee-Doodle is said to have been a British air known in the time of Cromwell by the name of Nankee-Doodle, and played with derisive reference to the similarity of this name to Yankee by the British troops in evacuating Boston. The Americans took it up and made it their national air. It has since been superseded by *Hail, Columbia*.

YAPOCK. See OPOSSUM.

YARD, a long piece of timber suspended upon the mast of a vessel to extend the sail. See SHIP.

**YARD**, a standard British linear measure containing 3 feet or 36 ins. See **WEIGHTS AND MEASURES**.

**YARKAND**, a city of Eastern or Chinese Turkestan, situated on a fertile plain on the north side of, and at a little distance from the river Yarkand, about 200 miles south-east of Kashgar. It is inclosed by a ditch, and a thick mud wall with towers at intervals. The houses in general are built of sun-dried bricks. Those of the rich are in large open squares surrounded by high walls and well-stocked with fruit-trees. The streets are in general too narrow to permit carts to pass. They are intersected by numerous canals, and where three or four streets meet there is always a tank for water. There is a large covered bazaar wide enough to admit carts. The inhabitants, like those of Kashgar, are very mixed in regard to race. The prevailing religion is Mohammedanism. There are 120 mosques and some caravanserais. During the period in which Eastern Turkestan was severed from China a commercial treaty was concluded at Yarkand in 1874 between Sir Douglas Forsyth, representing Great Britain, and Yakub Beg, who was then the independent ruler of Eastern Turkestan. Commercial intercourse with India sprung up in consequence. The chief trade at present is carried on with Russia. Estimated pop. 80,000 to 120,000.

**YARKAND**, a river of Eastern Turkestan, rises in the Karakorum Mountains, flows generally in a north-east direction, unites with the Kashgar to form the Tarim, which flows east and enters the Lob Nor lake, or series of shallow lakes.

**YARMOUTH**, GRKAT, a seaport, municipal, county, and parliamentary borough (with one member) of England, in the county of Norfolk, 22 miles east of Norwich, on a narrow slip of land between the Yare and the sea, and connected by a bridge over the Yare with Little Yarmouth, or South Town, in Suffolk. The older part, lying on the river, is remarkable for the great number of straight narrow lanes at right angles to the main streets, and known as the 'rows'. Between the older part of the town and the sea is the modern part, with a marine parade and other attractions. The parish church, founded in 1101, is a very large building, and the market-place is also of great size. There are a fine town-hall, a large custom-house, a fine library and museum, borough jail, a lofty Nelson monument, royal hospital, royal naval lunatic asylum, aquarium, two fine piers, and an ancient jetty. The quay stretches along the river upwards of a mile. The harbour is in the Yare, and is accessible by vessels drawing 18 or 19 feet. The shipping trade declined for a time, but is again growing steadily. Yarmouth is a great seat of the English herring-fishery, in which about 300 vessels and 3000 hands belonging to the port are employed; many hands are likewise engaged in the mackerel fishery, and in that for cod and other white fish. Many of the fish are cured, the cured herrings known as 'Yarmouth bloaters' being celebrated. There are malt-ing-houses, boat-building yards, rope-works, silk-rape factories, trawl-net works, &c. Yarmouth has risen into considerable importance as a watering-place. At a remote period the ground on which Yarmouth stands formed part of the bed of a great estuary, extending as far as Norwich. It first became firm ground about the year 1008. Immediately off Yarmouth, and parallel to the shore, is a great range of sand-banks, between which and the land is the safe anchorage of Yarmouth Roads. Pop. in 1891, 49,334; in 1901, 51,250.

**YARN**, thread of cotton, flax, wool, or silk spun for weaving or other purposes. Yarn, especially cotton, is an extensive manufacture in the United

Kingdom. The value of yarn of British manufacture exported from the United Kingdom for the undernoted years was as follows:—

	1874.	1890.	1901.
Cotton.....	£14,517,425	£9,065,502	£7,977,082
Linen.....	1,716,231	1,006,102	824,681
Jute.....	245,784	298,418	514,003
Silk.....	1,032,643	383,026	294,311
Woollen.....	5,558,560	6,027,203	5,238,647

**YAROSLAF**. See **JAROSLAV**.

**YARR**, a well-known British and European plant, *Spergula arvensis*. See **SPURRY**.

**YARRA-YARRA**, the Australian river on which Melbourne, Victoria, is situated. See **MELBOURNE**.

**YARRELL**, WILLIAM, a well-known naturalist, was the son of a newspaper agent in London, and born there in 1784. He followed his father's occupation, but early became imbued with a love of fishing and shooting, and was led to note carefully the habits of birds and fishes. In 1825 he sent his first contribution to the Zoological Journal, being a notice of some rare British birds observed in the years 1823-25. The same year he became a member of the Linnean Society, to whose Transactions he repeatedly contributed interesting papers on the subject of birds, and in 1849 he became its vice-president and treasurer. He also sent papers frequently to the Zoological Journal and to the Annals and Magazine of Natural History, in which, among other matters, is the account of his discovery, in conjunction with Mr. Jesse, of the oviparous propagation of the eel. But the great work of Mr. Yarrell, and the one by which his name will descend to posterity, is his History of British Birds (1843). A revised fourth edition appeared in 1871-85 in four volumes under the editorship of Prof. Newton and Mr. Howard Saunders. He also wrote a work on British Fishes (1836). He died unmarried at Yarmouth on 1st September, 1856.

**YARRIBA**. See **YORUBA**.

**YARROW**, a name given to a British plant of the natural order Compositæ, *Achillea millefolium*, also known by the name *milfoil* (which see in **SUPP.**).

**YARROW**, a celebrated pastoral stream of Scotland, in Selkirkshire, which rises at a place called Yarrow Cleugh, and, running east a few miles, forms a beautiful lake, called the Loch of the Lowes, which discharges its water into St. Mary's Loch. Issuing from the latter, the river, after a course of 16 miles through the district of Ettrick Forest, flows into the Ettrick near Selkirk. It is famous in Scottish song, and has been celebrated in poems by Scott, Wordsworth, and others.

**YAWL**. See **BOAT**.

**YAWNING**, or **GAPING**, an involuntary and wide opening of the mouth and inhalation of breath, generally produced by weariness or an inclination to sleep, sometimes by hunger, sympathy, &c. It often precedes the fit in some intermittent fevers, hysteria, and spasmodic asthma, and in some instances, by the frequency of its recurrence, becomes a real disease. Persons suffering from heart-disease may be liable to yawning fits. It is supposed by some to be determined by an interruption of the pulmonary circulation. Yawning is performed by expanding the chest, by extending the lungs, by drawing in, gradually and slowly, a large quantity of air, and gradually and slowly expiring it after it has been retained for some time, the muscles of the chest being restored to their natural state. When yawning is troublesome, long, deep respiration, or drawing in the air at long intervals, relieves it. Seeing others yawn often induces yawning.

**YAWS**, a disease occurring in North America, Africa, and the West Indies, and almost entirely

confined to the African races. It is characterized by cutaneous yellowish tumours, numerous and successive, gradually increasing from specks to the size of a raspberry, one at length growing larger than the rest; core a fungous excrescence; fever slight, and probably irritative merely. It is contagious, and cannot be communicated except by the actual contact of yaw matter to some abraded surface, or by inoculation, which is sometimes effected by flies. It is also called *frambesia*, from the French *framboise*, a raspberry. Some regard it as a form of syphilis.

**YEADON**, a town of England, in the West Riding of Yorkshire, is seated on an eminence 7 miles north-west of Leeds. It has a church with a square embattled tower; several denominational chapels; town-hall; mechanics' institute; cemetery, &c. Woollen manufacture is the staple. Pop. in 1891, 7396; in 1901, 7059.

**YEAR**, the period in which the revolution of the earth round the sun, and the accompanying changes in the order of nature, are completed. The accurate determination of the length of the year, which required great knowledge of astronomy and exact observations, could only be reached by the successive efforts of many generations. On this subject see **CALENDAR**. There are years of various lengths, according to the principle adopted in measuring them. The *sidereal* year is the interval that elapses while the sun moves from a star to the same star again (of course this motion is only apparent), a period the length of which is slightly affected by nutation (which see), but on the average is equal to 365 days, 6 hours, 9 minutes, 9.6 seconds. The *tropical* or *civil* year, sometimes called the *solar* year, is the time in which the sun moves from the vernal equinox to the vernal equinox again; its mean length is 365 days, 5 hours, 48 minutes, 49.7 seconds. This is the year as commonly understood. On account of the precession of the equinoxes it is rather shorter than the true period of the earth's revolution. (See **PRECESSION**.) The *anomalous* year is the time between two successive arrivals of the earth at its perihelion (which see), and its mean length is 365 days, 6 hours, 13 minutes, 49.3 seconds. A lunar year is the time required for 12 revolutions of the moon, which is 354 days, 8 hours, 48 minutes, 37 seconds. See also **DAY**, **SIDEREAL TIME**, **SOLAR TIME**.

**YEAST**, the barm or froth which rises in beer and other malt liquors during fermentation. Yeast is a plant of very simple organization, consisting of small nucleated cells varying from  $\frac{1}{1000}$  to  $\frac{1}{500}$  of a millimetre in diameter. The cells multiply by budding. Yeast possesses the power of bringing about the transformation of sugar into alcohol, carbon dioxide, and other products. See **FERMENTATION**.

**YEDDO**, officially since 1868 **TOKIO** or **TÖKYÖ**, the capital of the Japanese Empire, on the east coast of the island of Hondo, at the mouth of the Sumida-gawa in the Bay of Tokio. It is situated on a fertile, well-cultivated plain extending to the famous volcano of Fujiyama, and with its immediate surroundings it forms one of the districts known as *fu*. The river divides it into a smaller eastern part, and a greater western part, extending along the shore towards Yokohama. Most of the houses are constructed of wood. Of the bridges the most noteworthy are the Nippon-bashi (or Nihon-bashi), the Azuma-bashi, and the Riogoku-bashi. The Imperial Palace, in the heart of the town proper, is surrounded by moats and a high, thick wall, and adjoining it are splendid gardens, &c. Around it is the district called Kojimachi, penetrated by a number of broad canals, and surrounded by a moat and a wall. Here are most of the foreign embassy buildings, several government departments, the chief court buildings, the nar-

liament-house, the police-office, schools, &c. Outside the Kojimachi district there are the districts, Shiba, Azabu, Akasaka, Yotsuya, Ushigome, Koishikawa, Hongo, Shitaya, and Asakusa. The principal streets are the Ginza, with fine shops of the European kind; the Nakadori, where an extensive business is done in Japanese curios; and the Nagata-chu, where most of the diplomats reside. The city has several parks and gardens, among which are the Shiba park, with the tombs of some of the Shoguns; Uyeno park, with a museum and a race-course, and more particularly a fine lake; the Mukoshima gardens, on the east bank of the river; and the gardens of the Aoyama palace, inhabited by the crown-prince. The best bazaar is the Kwankoba, beside the Shiba park. The principal temples are that of Kwannon, surrounded by a garden, which is a favourite place of public resort, and contains a tower 230 feet high, erected in 1890; the Hië Jinja and the Shokonsha, Shinto temples; the Buddhist temple of Eko-in, erected in 1657 on the left bank of the river; the Monseki, also a Buddhist building; the Confucian temple Siedo, now containing a pedagogic museum; and two temples near the Uyeno park containing the tombs of Shoguns. There are English, American, Roman Catholic, Russian Orthodox, and German Lutheran churches. The city has two railway-stations, the Uyeno station of the northern railway in the north, and the Shimbashi station of the line to Yokohama in the south. These two lines are connected by the Tokio-Akabane line, which traverses the western suburbs. Street tramways were introduced in 1882, an electricity work in 1885, and a telephone system in 1890. The water-supply is provided by water-works begun in 1892. At the head of the educational institutions is the Imperial University of Tokio, which was till 1896 the only one in the country. It consists of a university hall and colleges of law, medicine, literature, science, engineering, and agriculture, and it has about 1600 students. There is a normal school, a school for nobles, a military academy, a military school, a naval academy, and a commercial school. The jinrikishas of the streets, peculiar light two-wheeled vehicles, each drawn by one man (or sometimes by two), serve as cabs. The manufactures or other industries include silks, lacquer-ware, porcelain, ship-building, machinery, &c. Yeddo was founded in 1456, but it did not become of any importance till about the end of the sixteenth century. In 1590 it was chosen as the seat of the Shoguns, and on the downfall of the shogunate in 1868 it became the capital of the empire and the seat of the Mikado. It was opened to foreign commerce in 1869, but its trade passes mostly through Yokohama, with which it was connected by a line of railway in 1872. Yeddo has frequently been visited by destructive fires and earthquakes. The earthquakes of November, 1855, and June, 1894, caused great loss of life and property. Pop. in 1899, 1,440,121.

**YEISK**. See **IEISK**.

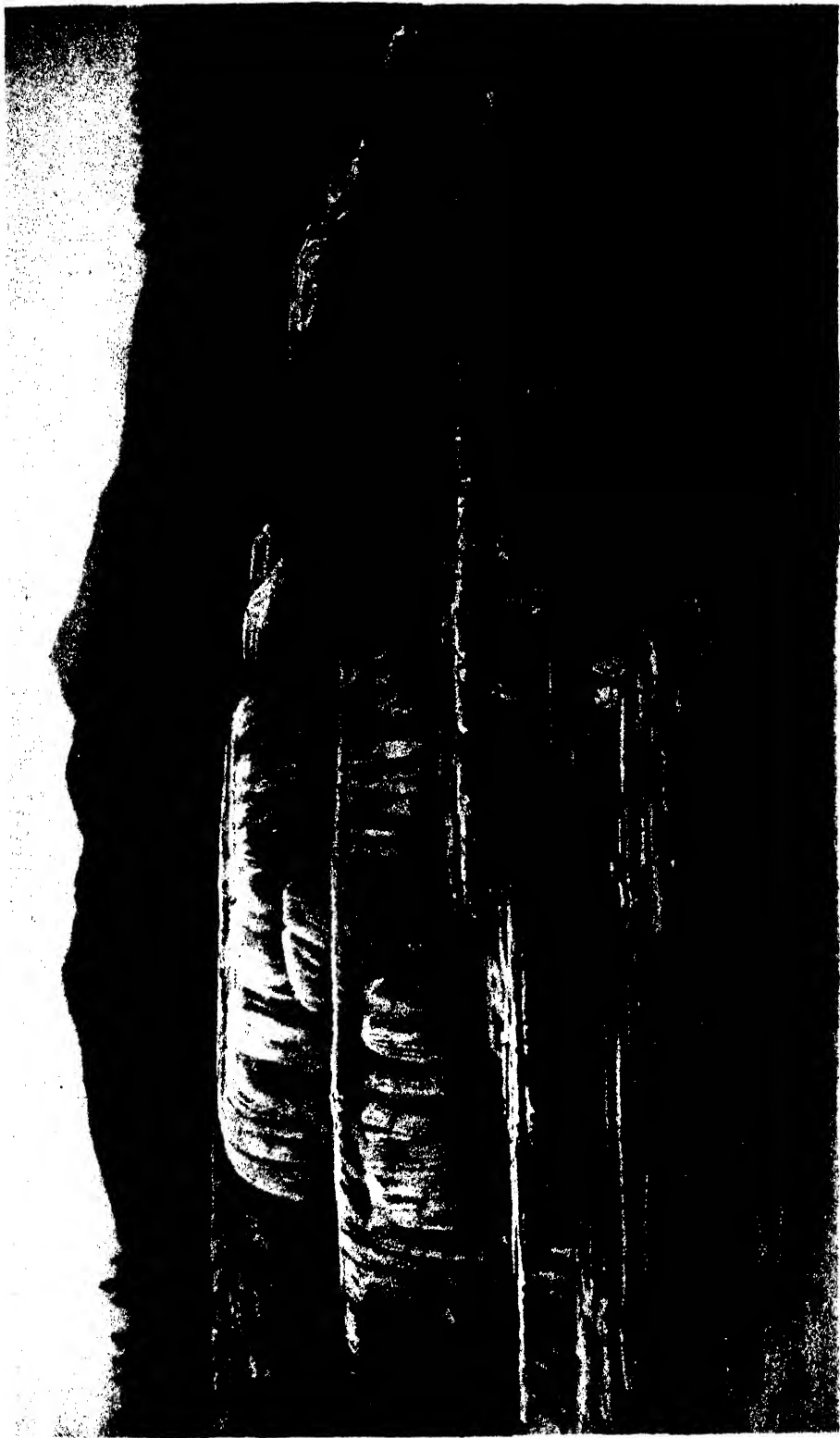
**YELETZ**. See **IELETZ**.

**YELL**, one of the Shetland Islands, separated from Mainland by Yell Sound. It is about 15½ miles in length and from 4 to 6 in breadth, having an area of 94 square miles, exhibiting a tolerably level surface, but a bold and rugged coast, indented by many bays or voes, well adapted for fishing stations. There are a few small patches of arable land near the shore, but the interior affords only a coarse pasturage for sheep and cattle, and a plentiful supply of peat; scarcely a shrub is to be seen. The highest point is 672 feet above sea-level. The inhabitants are principally employed in the fisheries. Pop. (1891), 2511; (1901), 2483.









SINTER TERRACES OF THE MAMMOTH GEYSER.



**YELLOW BERRIES.** See FRENCH BERRIES.  
**YELLOW COLOURS.** See COLOURING MATTERS.

**YELLOW FEVER,** an acute febrile disease, endemic in low districts on the coasts, but under certain circumstances sporadic in other places. A certain degree of heat seems to be necessary to its existence, as the first frost kills it. It frequently ravages the coasts of tropical America, the west coast of Africa, and the West Indian Islands; in Europe it has prevailed at Leghorn, and has visited several of the ports of Spain and Portugal, especially Gibraltar and Malaga; it was imported into France in 1861, and England in 1866, but it seems to have there restricted itself to its original victims. The attack is frequently preceded by general uneasiness, prostration, and spasmodic twitching or trembling of the members. At other times it is suddenly heralded by violent headache, accompanied by shivering, intense pain in the members, and above all in the lumbar regions. These primary symptoms are followed by a burning fever; the eyes are suffused, the face takes on an expression of suffering, stupor, or prostration which is characteristic of this malady; the tongue is dry, red at the tip, and afterwards covered with a thick mucus which gets gradually blacker as the disease advances. The patient is at the same time troubled with an insatiable thirst; the epigastrium is painfully sensitive to the slightest pressure. Nausea, gastric uneasiness, and a desire to vomit soon supervene. If these symptoms gradually lessen the patient may recover in twenty-four or thirty-six hours; but if they persist they soon become more aggravated; the pulse becomes more frequent and feeble, and the skin, which may by this time have acquired a pale yellow tint, turns darker; the stomach ejects at first a colourless, ropy, acid liquor, which soon begins to contain flakes of a dark colour, increasing until the matters have the appearance of a mixture of soot or coffee grounds and water; this is the black vomit, and is often ejected in great quantities upon the slightest movement of the patient. The skin is harsh and constricted and of a violent heat, and the patient often tosses himself about, uttering delirious cries, until the fatal prostration comes on which closes the scene. The above symptoms do not always occur as we have described them; sometimes there are only at the beginning headache, chills followed by moderate heat of the skin, some pain in the limbs, the epigastric pains infrequent, the heat and thirst trifling, and the strength so little lessened that the patient may not keep his bed, and he may recover in a day or two; but many of those 'walk-about cases' have terminated in death as promptly. Recent experiments seem to have proved that, like malaria, yellow fever is due to a poison introduced into the system by the bites of mosquitoes. Medical men differ widely as to the mode of treatment, some treating their cases with antiphlogistic or lowering remedies, and others with stimulants. In the most malignant cases the patient may die in a few hours, but this is rare; generally where death occurs it takes place in from three to nine days from the date of the attack. The convalescence is slow and protracted. The mortality produced by this disease has occasionally reached 90 to 95 per cent., and has sunk as low as 3 per cent. of those attacked. It is much more liable to attack white men than black, middle-aged people than the old or young, and males than females; it is also much more likely to affect new-comers to a hot country than either natives or acclimatized Europeans.

**YELLOW-HAMMER, or YELLOW-BUNTING** (*Emberiza citrinella*), a species of *Emberizinae* or Buntings, a sub-family of *Conirostrata Insectoria*,  
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distinguished by the sharp conical bill, and by the edges of the upper mandible being rounded and turned inwards. A knob exists on the palate. The yellow-hammer is a common British bird, living in fields and hedgerows. Its average length is about 7 inches. It is one of our prettiest birds. The colour is yellow above, varied by dark-brown patches, the under parts being pure yellow, and the wing-feathers dusky black, with brown or yellow edges. The flanks are of a brownish hue. The nest is placed on the ground, and generally near the roots of hedges and bushes, and is composed of grasses, moss, roots, &c., and lined with hair. The eggs number five, and are of a pale, purplish white colour, and marked with streaks and dots of reddish-brown. Both parents exhibit great attachment to their young and to each other, the male taking his turn upon the nest as well as the female. These birds, when fat, in the autumn, are much in request for their flesh. The name should probably be written 'Yellow-ammer,' the term *Ammer* being the German for Bunting. These inoffensive birds are regarded with superstitious dislike in some districts, and their eggs are broken by boys whenever they are discovered, a foolish saying being current that each egg contains a drop of 'devil's blood.'

**YELLOW RIVER.** See HOANG-HO.

**YELLOW SEA** (Chinese, *Whang-hai*), an arm of the Pacific Ocean, on the north-east coast of China, having on the west the Chinese provinces Kiangsoo, Shantung, and Pecheleo; north, Leaotong; and east, the peninsula of Corea; length, about 620 miles; greatest breadth, about 400 miles. North and north-west it terminates in the Gulfs of Leaotang and Pecheleo, into the latter of which pour numerous large and important rivers. On the east coast are numerous groups of islets, part of them included in the Korean Archipelago. It is very shallow, and obtains its name from the muddy lemon-yellow colour of its water near the land, arising from the nature of its bottom, which is often touched by vessels navigating it. The large quantity of alluvium continually brought into it by the rivers Hoang-ho and Yangtse causes it gradually to decrease in depth.

**YELLOWSTONE,** one of the largest branches of the Missouri River, rises in the Rocky Mountains, about lat. 44° N. After a short northerly course it passes through the lake of the same name, runs north-east through the territory of Montana, and joins the Missouri at Fort William, on the north-eastern frontier of that territory, after a course of about 1000 miles, in which it receives on its south bank the Big-Horn, Rosebud, Tongue, and Powder rivers. It is about 850 yards wide at its mouth, and navigable for about 700 or 800 miles.

The Yellowstone region was first partially explored by Captain Clarke in 1805, but it was not until 1870 and 1871, after the discovery of the Montana gold-fields had drawn to the upper valleys of the Missouri an adventurous population, that efficient scientific expeditions made a thorough exploration of the upper valley of the Yellowstone. The entire area, hemmed in by the loftiest peaks of the Rocky Mountains, is over 6000 feet above sea-level, and the Yellowstone Lake, which occupies an area of 15 by 22 miles, has an elevation of 7427 feet. The whole region is of pliocene age, and bears unequivocal traces of its having been the scene of prolonged and energetic volcanic agency. The innumerable hot-springs and geysers discovered by the explorers in a wide area all round the lake completely throw the geysers of Iceland into the shade. The Grand Geyser in the Firehole Basin is characterized as being the grandest, the most majestic, and most terrible fountain in the world. (See GEYSERS.) Not the least of the marvellous scenes of the Yellowstone are the

Grand Cañon, which the river traverses on its way from the lake, and the upper and lower falls over which it is precipitated. The Cañon is a fearful abyss 3000 feet in perpendicular height, and to one looking up from the bottom the stars are visible in broad daylight. The upper fall is 140 feet high, and within  $\frac{1}{4}$  mile the river leaps over a precipice of 350 feet. In consideration of the importance of the discoveries made by the explorers sent out by the United States, and from a conviction that in a few years this region would be a place of resort for visitors from all parts of the world, the government passed an act (1st March, 1872) withdrawing from occupancy, settlement, or sale the tract of land described, being in extent 55 by 65 miles, which territory is set apart as a great national park for the benefit and enjoyment of the people.

**YELLOW WEED.** See **WOLD**.

**YEMEN**, a principal division of Arabia, occupying the south-west angle of the peninsula, and known both to the ancients and moderns as Arabia Felix (Arabia the Happy), from a mistranslation by Ptolemy of *Yemen*, which does not signify *happy*, but the land lying to the *right* of Mecca. Yemen, in the widest sense, is bounded on the west by the Red Sea, on the south by the Gulf of Aden, on the north by Hejaz and Nejd, and on the east by Hadramaut. It comprises two regions physically distinct: the Tehama or Lowland, lying between a chain of mountains which extends throughout the country and the west coast; and an elevated mountainous tract to the eastward of the former. The Tehama varies in breadth from 10 to 30 miles, and is a barren desert wherever it is not irrigated by the mountain streams. The mountains rise abruptly from the desert plain, inclosing valleys of great luxuriance. The tableland in the interior has an estimated elevation of 4000 feet, and some of its mountain groups, as Sabar, south of Taes, attain a height of 7000 to 8000 feet. The loftiest of these mountains are clothed with forest to the summit, and the tableland abundantly produces coffee, dates, senna, tobacco, and other productions of rather a warm temperate than a torrid region. Yemen, considered in the extent above indicated, has no longer a political existence; the frontier provinces have in some instances become independent, and the Yemen proper of the present day, or the Turkish vilayet known by this name, does not probably embrace above two-thirds of the territory formerly included under the same general title. Yemen, taken collectively, still bears unmistakable traces of its ancient superiority in wealth and civilization. In its numerous well-built towns are many rich merchants, while in the well-populated rural districts the peasantry are generally in easy circumstances. There are two great schools or universities, one at Zebid for Sunnites, and another at Damar for the Zeide. The principal towns are Sana the capital, Mocha, and Aden, which last is now in the possession of the British. See **ARABIA**.

**YENIKALE, STRAIT OF**, called also **STRAIT OF CAFFA** and **STRAIT OF KERTCH**, connects the Black Sea with the Sea of Azov; it is about 25 miles long and from  $2\frac{1}{2}$  to 8 miles broad, but in some places is so shallow as to leave a channel of little more than 2 fathoms deep.

**YENISEI**, a river of Asia, formed by numerous streams from the mountain ranges bordering the Chinese and Russian Empires, enters Siberia about lat. 52° N.; lon. 92° 30' E.; flows first circuitously and then almost directly north, and forms the long and wide estuary of the same name, entering the Arctic Ocean after a course of about 3400 miles. The area of its basin is estimated at about 1,000,000 square miles. The principal towns on its banks are Minu-

sinsk, Krasnoirsksk, Yeniseisk, and Turukansk. It has sufficient depth to the last-named town for large vessels. It is well supplied with fish. A canal has been made to connect it with the Ob.

**YENISEISK**, or **JENISEISK**, a town of East Siberia, in the government of the same name, on the left bank of the Yenisei. It has several churches, a monastery, a custom-house, an extensive trade, particularly in furs; and an annual fair. Pop. (1897), 11,739.

**YEOMANRY, IMPERIAL**, a volunteer force of mounted infantry formed during the recent South African war by there organization and extension of the yeomanry cavalry force which was embodied during the wars of the French Revolution. The yeomanry originally included both infantry and cavalry, but the former were disbanded in 1814. The cavalry had a county organization, and was a somewhat exclusive force, since each man had to provide his own horse and uniform. They could be called out in aid of the civil power, and in the event of invasion, actual or threatened, they could be ordered for service in any part of Britain. An army order of April 17, 1901, provided that the name should thenceforth be Imperial Yeomanry, and that the brigade organization should be abolished and replaced by an organization in regiments of four squadrons, with a regimental staff and a machine-gun section. During the period of training the daily pay is to be from 5s. 6d. to 9s. 6d., according to rank. A horse allowance of £5 is also made. A later order of the same year abolished all corps of volunteer light horse and volunteer companies of mounted infantry, some of them being merged in squadrons of imperial yeomanry. The normal establishment under the scheme of 1901-1902 is 35,000; the sum allotted for regimental pay, allowances, &c., was £75,010, and for reorganization and extension, £300,000.

**YEOMEN OF THE GUARD.** See **BREFF-EATERS**.

**YEOVIL**, a municipal borough and market town in Somersetshire, on the river Yeo or Ivel, 33 miles s.s.w. of Bath. It has good streets, well-built freestone houses, a fine cruciform church (restored) with a tower dating from the fifteenth century, several other places of worship, schools, a town-hall, corn-exchange, public baths, a temperance-hall, almshouses, &c. The town carries on an extensive manufacture of kid and other gloves, and is a railway centre of some importance, being in connection with the South-Western and Great Western Railways. Pop. (1891), 9648; (1901), 9838.

**YESSO**, **Yezo**, or **HOKKAIDO**, the most northerly of the main Japanese islands, extending from Hondo, from which it is separated by the Tsugaru Strait, to Sakhalin, from which the La Pérouse Strait divides it, and Kunashiri, the most southerly of the Kurile Islands, from which the Yesso Strait separates it; area, including dependent islands, 30,136 sq. miles. It is curiously like a skate-fish in shape, and is traversed by chains of mountains, the principal summits being Tokachi-dake (8200), Shribetsi-yama (7874), Ishikari-dake (7710), Sapporo-dake (6500), and Komaga-take (3830). Much of the island is volcanic, especially in the east. The chief rivers are the Ishikari and Teshio, flowing into the Sea of Japan; and the Tokachi, flowing into the Pacific Ocean. The chief bays are Volcano Bay, in the south; Ishikari Bay, in the west; Shari and Wal-fish Bays, in the north-east. The forests furnish valuable timber. Coal, petroleum, and gold are found and worked to some extent. The capital is Sapporo, but Hakodate and Otaru are larger towns. Hakodate, Mororan, Otaru, &c., are open ports.



Kerosene, oer, glass, and other articles are manufactured, and internal communication is facilitated by a system of railways, either constructed or projected, joining all the important coast and interior towns. Pop. in 1898, 605,742, including 17,573 Ainos; of the administrative division, including the Kurile Islands, 610,155.

**YEW** (*Taxus baccata*), an evergreen tree belonging to the natural order Taxaceæ, common in many parts of the north of Europe. The yew has the leaves linear, acute, coriaceous, shining above, paler beneath; female cone of a few minute scales, and one terminal erect ovule seated on a fleshy disk, which enlarges into a red fleshy cup, containing the seed. The yew was formerly extensively cultivated in Great Britain, and on account of its gloomy and funeral aspect was usually planted in churchyards. The wood, which is peculiarly hard, smooth, and tough, was in former times made into bows, for which purpose it was considered very suitable. In the formal style of gardening which was once prevalent, few trees were more the subject of admiration, from its bearing to be clipped, without injury, into almost any form. Yews were cut into the shape of men, quadrupeds, birds, ships, &c. The wood is hard, beautifully veined, and susceptible of a very high polish; hence it is valuable for veneering and other cabinet work, and is in frequent use. From its hardness and durability it may be made into cogs for mill-wheels, axle-trees, and flood-gates, which scarcely ever decay. The leaves and young branches act as narcotico-acrid poisons both to men and cattle. A species of yew (*T. Canadensis*) is found in Canada and the extreme northern parts of the United States. It is a low, prostrate shrub, commonly called the *ground hemlock*, and never forms an erect trunk.

**YEZD**, a town of Persia, in the province of Khorasan, in a large sandy plain, 245 miles east of Ispahan. It is about 5 miles in circuit; consists of an old town, inclosed by a wall and ditch, defended by a citadel, and entered by four gates; and of a much larger new town or suburb, which has risen up in a very straggling manner, to meet the wants of the increasing population. Within the citadel are a palace, the principal mosque, several other public buildings, and the residences of the chief men of the district. The bazaars are spacious and well supplied, particularly with the staple manufactures of the town itself, consisting of silk stuffs, velvets, cottons, coarse woollens called *numuds*, loaf-sugar, and sweatmeats. The position of Yezd, on the edge of a desert, at the junction of the principal caravan-routes, makes it an important commercial entrepôt for the surrounding countries. Pop. 40,000, of which about a tenth are fire-worshippers.

**YGDASIL**. See NORTHERN MYTHOLOGY.

**YMUIDEN**. See Y, or IJ.

**YOKOHAMA**, the chief seaport and treaty-port in Japan, on the Bay of Tokio, about 17 miles south-west of Tokio, of which it is the port. Yokohama is of recent upgrowth, its rise being due to the opening of Japan to foreign commerce and to the establishment here of foreign merchants, consuls, &c., after the adjacent Kanagawa was declared a treaty-port. It is in general poorly built, with houses mostly of wood. The dwelling-houses and warehouses of the foreign residents are of a superior character, and built along the frontage facing the bay. The commercial buildings occupy the east of the town, the western part being the Japanese town, and the centre being occupied by the prefecture, custom-house, post-office, and other official buildings. The harbour is protected by breakwaters, and reclamation works are in progress. The imports into Yokohama in 1901 were valued at £9,037,275, mainly

sugar, metals and metal manufactures, cotton manufactures, kerosene, raw cotton, and woollens; the exports at £13,661,047, mainly raw and manufactured silk, copper, tea, fish, cotton goods, fish-oil, and paper. The number of vessels entered in 1901 was 823, with a tonnage of 2,032,445, mainly British, Japanese, German, and American. Yokohama is in railway communication with Tokio and all the chief towns of Hondo. Pop. (1902), 267,550 (989 British). See KANAGAWA.

**YONNE**, a department of France, bounded on the north by Seine-et-Marne, north-east by Aube, east by Côte-d'Or, south by Nièvre, and west by Loiret; area, 2868 square miles. The surface is generally intersected by low hills, sometimes barren, but usually covered with fruitful vineyards, which yield the famous Chablis, Joigny, Auxerre, and Tonnerre wines. Between the hills lie beautiful and productive valleys. The most elevated land is in the south-west, forming the water-shed between the basins of the Loire and Seine. The small part belonging to the former is drained by the Veille. All the rest belongs to the latter, which receives it chiefly by the navigable Yonne. The climate is temperate, and the air pure and healthy, except in some west marshy spots. The minerals include iron, red and yellow ochre, building-stone, lithographic-stones, pavement, and potter's-clay. The manufactures are of coarse woollens, woollen covers, serge, glue, &c. The trade is in corn, wine, vinegar, wood and charcoal, ship-timber, wool, cattle, iron, and ochre. It is divided into the five arrondissements of Auxerre, Avallon, Joigny, Sens, and Tonnerre. Auxerre is the capital. Pop. (1901), 321,062.

**YORK**, the largest county of England, bounded on the north by the Tees, separating it from the county of Durham, east by the sea, south-west by the county of Lincoln, from which it is mostly separated by the Humber, south by the counties of Nottingham and Derby, south-west by a small projection of Cheshire, and west by Lancashire and Westmoreland; greatest length from east to west, measured on the parallel of 54° N., 96 miles; central breadth, 80 miles; area, 6095 square miles, or 3,882,851 acres. The coast from the mouth of the Tees to the magnificent chalk-cliffs of Flamborough Head, which rise over 300 feet above the sea, is bold and rocky, but immediately beyond begins to descend, and from Bridlington Bay to Spurn Head lies low, and exposed to the constant ravages of the sea. The interior, viewed generally, consists of a long and wide central valley, stretching S.S.E. from the north frontiers of the county to the Humber, and inclosed both east and west by tracts of considerable elevation. On the east side these tracts form in the north bleak moorlands, rising often to a height of above 1000 feet and sometimes above 1400 feet, and extending from 20 to 30 miles inland from the coast, in which their terminations are seen in the bold cliffs already referred to. In the south part of the east side, the heights, here called wolds, become lower, and instead of reaching to the coast, recede so far from it as to leave a large alluvial tract, known by the name of Holderness. On the west side of the central valley the heights gradually increase, and ultimately become part of what is called the English Pennine chain, the loftiest points of which, within the county, are Wharfedale, Pennigant, Ingleborough, and Mickle Fell, the last of which, 2596 ft., is the highest. The central valley is both narrow and elevated in the north, but gradually widens out as it descends, and finally as it approaches the Humber becomes a large and somewhat swampy flat. The Humber receives almost all the drainage of the county by the Ouse, and its tributaries the Swale, Yore,

Wharfe, Derwent, Aire, and Don. A small part of the west is drained by the Ribble, of the north by the Tees, and of the east directly by the German Ocean. The south-east part of the county is covered with alluvial deposits. Immediately north and west the cretaceous formation stretches in a curve, first from Flamborough Head westward, and then south through the wolds to the Humber. The far greater part of the north moorlands is oolitic, but a belt of lias, commencing a little south of Whitby, skirts the coast north to Huntecliff, and then takes a very circuitous direction, first south-west through Guisborough, to Northallerton, then south past Thirsk to the valley of the Swale, and finally through Easingwold, Pocklington, and Market-Weighton, where it comes into contact with the chalk. In the north-east of the county valuable beds of ironstone exist in what are known as the Cleveland Hills, and iron-smelting and other allied industries are now carried on on a vast scale in Middlesbrough and its vicinity. (See MIDDLESBOROUGH.) Outside and immediately north and west of the irregular belt of lias, the new red sandstone becomes largely developed, extending along the banks of the Tees, then south into the valley of the Swale, and then widening out so as to cover a large part of the vale of the Ouse. The new red sandstone is succeeded by the magnesian limestone, which is in many places rich in lead ore, and stretches continuously through the county from north to south, seldom, however, attaining a width of above 5 miles. This limestone, in the south of the county, forms the east edge of the great central coal-field of England, of which Yorkshire thus possesses a valuable portion, extending north from Sheffield to Leeds, and west from Pontefract to Huddersfield. Coal-mining is extensively engaged in, the coals being largely consumed by the manufacturing industries of the county, and in iron-smelting. Under the coal-field lies in the north and west the millstone-grit, which is succeeded throughout the west by the mountain-limestone, of which all its loftiest summits are composed. The properties of the soil differ much according to locality. In the north, where moorlands prevail, good arable land is almost entirely confined to a few well-sheltered valleys, and the far greater part of the available surface is devoted to grass-husbandry, for the rearing of stock, particularly horses. The wolds consist generally of a light friable calcareous loam, well adapted for barley and turnips, though perhaps more profitably employed in permanent pasture, as it is apt to deteriorate under the plough, and cannot be maintained in fertility without heavy doses of manure. The central valley, particularly where it widens out, contains rich tracts, admirably fitted for any agricultural purpose. The alluvial tracts of Holderness and the banks of the Humber, where thousands of acres have been gained by warping, are celebrated for their luxuriant crops of wheat, beans, and hay. About 140,000 acres are under wood, and some 530,000 acres are mountain and heath grazing land. The area under corn crops, including oats, barley, wheat, &c., is about 620,000 acres; that under green crops, including turnips, potatoes, mangold, &c., is about 280,000 acres. Some 1,550,000 are permanent pasture. Manufactures have made great progress, particularly in the west and south, where some of the leading branches of national industry have long fixed their seat. Among other manufactures may be mentioned the woollens of Leeds, Bradford, Halifax, Dewsbury, and Huddersfield; the linens of Leeds and Barnsley, the iron and steel manufacture of Middlesbrough and Sheffield, and the hardware, cutlery, and plated goods of Sheffield.

Yorkshire is divided into three ridings—North,

East, and West, which have their common point of junction near the city of York. The county is well supplied with means of communication. In the south almost every important stream has been made the feeder of a canal, and many engineering works of great magnitude and difficulty have been executed. The railway system of the county, already extensive, is growing rapidly in completeness every year. The West Riding in particular is covered with a net-work of railways. York returns 26 county and 26 city and borough members to the House of Commons. Pop. (1891), 3,208,828; (1901), 3,585,122.

YORK (British, *Cæter Eborac*; Latin, *Eboracum*), an archiepiscopal city and municipal and parliamentary borough of England, a county in itself, and capital of Yorkshire, 196 miles N.N.W. from London by rail, pleasantly situated in a wide and fertile vale, at the confluence of the Foss with the Ouse, the latter of which is crossed by three fine bridges, besides a railway bridge. It consists of the city proper, and of suburbs, some portions of which are situated across the Foss, and communicating with the rest by several bridges. The city, embracing a circuit of nearly 3 miles, is inclosed by ancient walls, originally Roman, but restored by Edward I., and partly repaired at subsequent periods; the portions which still remain have been converted into delightful promenades, commanding a beautiful prospect of the surrounding country. York is entered by four principal gates of imposing structure; and is built for the most part in narrow irregular streets, often lined with houses of very antique appearance. The work of improvement, however, has been rapidly carried on, and while many of the older parts of the city have been modernized, many handsome ranges of new buildings have been erected. In a spacious thoroughfare, called Parliament Street, which is terminated at one extremity by St. Sampson's Square, and at the other by the Pavement, the provision markets and also fairs are held. Among public edifices, the great object of attraction is the minster or cathedral, which dates from the seventh century, but did not begin to assume its present form till 1171, and was not completed till 1472. It is built in the form of a cross with a square massive tower rising from the intersection to the height of 235 feet, and two other lofty towers of graceful proportion, 196 feet, flanking a gorgeous and richly-decorated western front. This front is divided by panelled buttresses into three compartments, of which that in the centre is chiefly occupied by a beautiful window and a splendid portal, forming the principal entrance. Measured without the walls, the whole length, from east to west, is 524 feet, and the width across the transepts, north to south, 222 feet; length, from west door to choir, 264 feet; length of choir, 162 feet; breadth of body and side aisles, 109 feet. The impression produced by the external building is fully sustained by the interior, which consists chiefly of a lofty nave, separated from its aisles by long ranges of finely clustered columns, a still loftier choir, lighted by a magnificent and beautifully painted window, and a lady-chapel continuing the choir, and containing some beautiful monuments. This noble ecclesiastical edifice, the largest and finest of which England can boast, has twice sustained serious damage and narrowly escaped total destruction from fire, caused in 1829 by an incendiary lunatic, and in 1840 by the negligence of a workman engaged on its repair. The chapter-house, entered from the north transept of the cathedral, is in the form of a richly decorated octagon, and near it is a fine old chapel, originally forming part of the old archiepiscopal palace, and now appropriated to the library. Besides the cathedral York possesses many other churches,

various Dissenting chapels, a beautiful R.C. chapel, and collegiate, grammar, blue-coat, gray-coat, and board schools. Other buildings and establishments of note are an ancient Gothic guildhall (1446), and spacious mansion-house adjoining; the fine old ruins of St. Mary's Abbey; Clifford's Tower, on the site of an old castle founded by the Conqueror; the fine old merchants' hall; county assize courts; city courts of justice in the late Gothic style (1892); the museum of the Yorkshire Philosophical Society, assembly-room, masonic hall, baths, art-gallery, free library, the Yorkshire Club-house, concert-rooms, two theatres, cemetery, lunatic and blind asylums, dispensary, county hospital, cattle-market, almshouses, and numerous other charities. The railway-station is one of the finest in the kingdom. The manufactures are fairly important, including iron-castings, bottles, leather, flour, cocoa, and confectionery. York is the head-quarters of the North-Eastern Railway Company, and contains their carriage and wagon shops. There is communication by water with Selby, Goole, Hull, &c. York is the centre of the north-eastern military district.

The origin of York is so ancient as to be almost lost in fable. Under the Romans it became their principal seat of power in the north, if not in the whole country, and after their departure it so far retained its importance as to become the capital of Northumbria, whose king, Edwin, in 624 made it an archiepiscopal see. In the eighth century its diocesan school attracted students not only from all parts of the kingdom, but from France and Germany, and sent out scholars who afterwards acquired a European fame. Here the first English Parliament was held by Henry II. in 1160. In after-times it makes a distinguished figure in almost all the great epochs and events of English history. The city boundaries were extended in 1884 and 1893. It sends two members to Parliament. Here died the Roman emperors Severus and Constantius Chlorus, and here it is popularly (but incorrectly) supposed Constantine the Great was born. Among its distinguished natives are Alcuin, the tutor to the family of Charlemagne; Flaxman the sculptor; and William Etty the painter. Pop. in 1891, 66,984; in 1901, 77,793.

YORK, HENRY STUART, CARDINAL OF. See STUART.

YOSEMITE VALLEY, in Mariposa County, California, about 50 miles south-east of Sonora, near the south-west base of the Sierra Nevada. It is about 10 miles long and over 1 mile broad, is diversified by trees and thickets like the park of an English mansion, and surrounded on three sides by almost perpendicular walls of granite rock 3000 feet high. Over the highest of these, at the extremity of the valley, the Yosemite Creek, a tributary of the river Merced, pours its waters sheer down an unbroken cataract 1436 feet in height, and thence by two farther leaps of 626 and 400 feet, reaches a miniature lake below after a descent of about 2500 feet. From this lake the river issues in a narrow stream, and with many a curve tumbles between the dark rocky mountain walls of the valley or glides through the deep shadow of the woods of oak, pine, and poplar which clothe its banks. This picturesque spot is regarded as one of the natural wonders of the American continent, and in 1864 it was set apart as a public park. For detailed account see Whitney's Yosemite Guide-book; Hutchings' In the Heart of the Sierras; and Baedeker's United States.

YOUGHAL, a seaport and municipal borough of Ireland, in the county of Cork, on the estuary of the Blackwater, here crossed by an iron bridge, 154 miles south-west from Dublin. The public buildings are two Episcopal churches, a handsome Roman Ca-

tholic chapel, several other places of worship, a town-house, fever hospital, &c. Sir Walter Raleigh's residence, now called Raleigh's House, is still maintained nearly in its original state. The harbour is obstructed at the entrance by a bar, and the port carries on merely a coasting-trade. Large quantities of grain are shipped, and Cork is supplied with good bricks from this vicinity. The salmon-fishery of the Blackwater is productive. Pop. (1891), 5722; (1901), 5393.

YOUNG, ARTHUR, a distinguished agricultural writer, was the son of Arthur Young, a prebendary of Canterbury, and born 11th September, 1741. He was intended for a mercantile career, but early attempted literature, and then adopted the profession of agriculture, carrying on farms at various places, and especially on his paternal estate, near Bury St. Edmunds. He soon became famous as a writer on farming and allied topics, and especially for his agricultural tours. He also carried on an extensive correspondence with public men both at home and abroad. In 1784 he began the publication of his *Annals of Agriculture*, of which forty-six vols. 8vo were issued. This work had the most important influence upon the art of agriculture in England, and a considerable portion of it was translated into French under the auspices of the government. In 1793 he was appointed secretary of the newly-erected board of agriculture, with a salary of £400 a year. Young not only visited and examined with great attention many parts of England and Ireland, but also made several tours on the Continent. He became blind some years before his death, which happened on the 20th April, 1820. Of his numerous works we can mention only the principal:—*The Farmer's Letters to the People of England* (1767, enlarged edition 1777); *Six Weeks' Tour through the Southern Counties* (1768); *Six Months' Tour through the North of England* (1770); *Farmer's Tour through the East of England* (1771); *The Farmer's Calendar* (1771); *Tour in Ireland* (1780); *Travels in France during the Years 1787–89* (1792), treating of agriculture and national resources, the social and political condition of the people, the most reliable source of information regarding the state of France on the eve of the revolution. See his *Autobiography*, edited by Miss Betham-Edwards (1898).

YOUNG, EDWARD, a distinguished English poet of the 18th century, was born at his father's rectory of Upham, in Hampshire, in 1683. He was educated at Winchester School, and at New College and Corpus Christi College, Oxford. In 1708 he was nominated to a law fellowship in All Souls College; he took the degree of B.C.L. in 1714 and of D.C.L. in 1719. By this time he had formed some connection with the Duke of Wharton, and an annuity of £100 was granted him by the duke. In 1719 and 1721 respectively appeared his tragedies of *Busiris* and *Revenge*, both produced at Drury Lane. In 1725 he began the publication of a series of satires called *The Universal Passion*. He now took holy orders, and in 1728 was nominated one of the royal chaplains. In 1730 the College of All Souls presented him with the rectory of Welwyn, in Hertfordshire, valued at £300 a year, and to which the lordship of the manor was attached. A year later he married Lady Elizabeth Lee, widow of Colonel Lee and daughter of the Earl of Lichfield, and by this lady he had a son. After his marriage the poet lived much in retirement in his rectory at Welwyn, sadly disappointed that church preferment, which he so eagerly desired and so unscrupulously belauded those in power to obtain, was refused him. He died on 5th April, 1765. The work by which he is best known is *The Complaint, or Night Thoughts on Life, Death, and Immortality*, a series of argu-

mentative poems in blank verse, intended to prove the immortality of the soul and the truth of the Christian religion—a work displaying great force of pious and somewhat gloomy reflection, and containing many lofty passages, marred by a straining after antithesis and ornament. The *Night Thoughts* were translated into French and German, and seem to have been fully as popular on the Continent as at home. They were published in 1742–45, shortly after the death of his wife, the Lucia of the poems. The *Philander* and *Narcissa* are supposed to be Mr. Temple, son of Lord Palmerston, and his wife, the poet's step-daughter, who was prematurely cut off by consumption in 1736 while travelling in the south of France in company with her husband, mother, and step-father. Young availed himself of more than a poet's licence when he states that, as a Protestant, she was denied a grave, 'denied the charity of dust to spread o'er dust'. She was buried in the Reformed Swiss cemetery at Lyons. Of Young's three tragedies, *Busiris* (1719), *The Revenge* (1721), and *The Brothers* (1753), only the second has kept a place on the stage. *The Last Day*, an early effort (1714); *The Universal Passion* (1725–28), a series of satires, containing many witty and shrewd observations; several unsuccessful odes; a prose satire on the fashionable life of the time, entitled *The Centaur* not *Fabulous*, and some other poetic and prose pieces, are now only known to the literary student.

YOUNG, THOMAS, M.D., eminent in natural philosophy, born at Milverton in Somersetshire in 1773, was the son of Quaker parents, and was brought up in the strict discipline of that sect. He himself informs us that at the age of two he could read with considerable fluency; and before he was four he had read both the Bible and Watts' hymns twice through; and when six years old had learned by heart the whole of Goldsmith's *Deserted Village*. In 1782 he went to school at Compton in Dorsetshire, where he remained four years, during which period his studies comprehended mathematics, Latin, Greek, Hebrew, Persian, and Arabic, besides French and Italian. When little more than fourteen he was appointed classical tutor to Hudson Gurney, grandson of David Barclay of Youngsbury; and the scholar and preceptor were subsequently joined by Mr. Hodgkin, who had the general superintendence of young Gurney's studies, though his youthful preceptor continued to retain his office for five years. About the end of 1792, under the advice of Dr. Brocklesby, a great-uncle, he commenced the study of medicine in London. Thence he went to Edinburgh, and then to Göttingen, where, after a residence of nine months, he took his doctor's degree. He completed his medical studies at Cambridge, receiving the degree of M.D. in 1808. Eleven years before that date Dr. Brocklesby had died, leaving Young £10,000, his house in London, and a collection of pictures. As early as 1799 Young wrote his celebrated memoir on the *Outlines and Experiments respecting Sound and Light*, which speedily conducted him to the discovery and demonstration of the interference of light. This discovery alone, according to Sir J. Herschel, would have sufficed to have placed its author in the highest rank of scientific immortality. In 1801 he accepted the office of professor of natural philosophy at the Royal Institution, and in 1802 that of foreign secretary to the Royal Society—an office which he held for the remainder of his life. The series of lectures which he delivered in connection with his professorship form the substance of his great work on *Natural Philosophy and the Mechanical Arts* (two vols. 4to, 1807). In 1811 he was elected physician to St. George's Hospital. While engaged in his profes-

sional and scientific labours Dr. Young contributed numerous articles to the *Quarterly Review*, over sixty to the *Encyclopedia Britannica*, and many others to the scientific journals. We can only afford space for a passing allusion to his hieroglyphical researches. Dr. Peacock, one of his biographers, seems to show completely that he had made great progress in the discovery of phonetic hieroglyphics many years before Champollion had entered the field. (See *HIEROGLYPHIC WRITING*.) In 1818 he was appointed secretary to the board of longitude, with the charge of superintending the *Nautical Almanac*. The harassing effects of personal attacks with reference to his management of this publication aggravated the disease (ossification of the aorta), which terminated his existence at Park Square, London, 10th May, 1829. Three volumes of his *Miscellaneous Works*, with a life, were published under the care of Dr. Peacock and J. Leitch by Murray in 1855.

YPRES (Flemish, *Yperen*), a town of Belgium, in the province of West Flanders, in a plain, on both sides of the Yperlee, 28 miles s.w. of Bruges (53 miles by rail). Ypres was early one of the most important manufacturing towns of Flanders, and in the fourteenth century had 200,000 inhabitants and employed 4000 looms. Its manufacturing prosperity has long departed, but a striking monument of it remains in its cloth-hall (*Les Halles*), an immense pile erected in the thirteenth and fourteenth centuries, in the public square, in the form of an irregular trapezium, and surmounted by a square tower or belfry, with a clock and chimies. One of its wings is now used as the town-house, and other parts are occupied by different public establishments and concert-rooms. Another building of note is the Gothic cathedral of St. Martin, dating from the thirteenth century, one of the most remarkable religious edifices in Belgium. The chief manufactures are cottons and lace. Ypres was made by Louis XIV. in 1688 one of the strongest fortresses of the Low Countries, and in the great European wars seldom escaped a siege or bombardment. It is no longer fortified. Jansen was Bishop of Ypres, and is buried in the cathedral of St. Martin. Pop. (1897), 16,998.

YPSILANTI, an old Greek Fanariot family claiming, without good grounds, to be descended from the Comneni, and furnishing several hospodars to Moldavia and Walachia. Constantine Ypsilanti was appointed by the Sultan Selim III. hospodar of Moldavia and Walachia, but was deposed in 1806, on account of his Russian sympathies. He died at Kiev, in 1816. His eldest son, Alexander, born at Constantinople in 1792, having entered the Russian service and served with distinction, was raised to the rank of major-general in 1817. In 1820 he became acquainted with the Hetaireia, a secret society organized for the purpose of freeing Greece from the Turkish yoke, and having joined this association he eventually became its head. Assisted by the Hetairists, he succeeded in raising an insurrection in Moldavia and Walachia, but being defeated by the Turks he had to make his escape into the Austrian dominions. Here he was detained as a state prisoner, along with his brother Nicholas, until they were released on the demand of Russia in November, 1827, under the condition imposed by Austria, that the prince should not leave the Austrian dominions. Ypsilanti died at Vienna in January, 1828, hardly thirty-six years of age.—His brother Demetrius, born Dec. 25, 1793, also entered the Russian service, and seconded Alexander in his efforts for the liberation of Greece. In 1822 he was proclaimed Prince of Peloponnesus, and by his defence of Argos in that year he paved the way for the destruction of the Turkish army in the narrow defiles between Corinth

and Argos. In 1823 he withdrew from public affairs, but he held the command of the troops in Eastern Greece from 1828 to 1830. He died in 1832.

**YTTERBIUM**, one of the cerium metals, occurring in gadolinite and other minerals found in Siberia, Scandinavia, and Greenland. It belongs to an obscure group, including yttrium, terbium, erbium, &c., and, like its allies, it is not known with certainty to be an element. Its symbol is Yb, atomic weight 173. (See next article.)

**YTTRIUM** (from Ytterby in Sweden), an earthy metal of the cerium group, one of the chemical elements, symbol Y, atomic weight 89. Little or nothing is known of its properties, and even its elementary nature is not yet established beyond doubt. (See above article.)

**YUCATAN**, a peninsula of Central America, comprising the Mexican states of Campeche and Yucatan, British Honduras, and part of Guatemala. It is a limestone plain of coralline formation, and, except for some ridges in the south and in the centre, it has no hills. It has little wood, except near the coast, and surface water is almost wholly absent, though underground water is abundant. The water stored in natural caverns is reached by means of steps cut in the rock, and the Maya Indians formerly excavated large storage basins, many of which have become hotbeds of fevers. Some of the many rock caverns have been inhabited or used as refuges during periods of war or revolution. The climate is warm, and generally unhealthy. Minerals of importance are wholly wanting. Some maize and rice are cultivated, but the principal vegetable product is henequen or Sisal hemp. Logwood is a product of the forests. Salt is obtained on the coasts, and the fisheries are very productive. Yucatan and the neighbouring districts were the seat of ancient kingdoms of the Mayas, who were the most highly civilized of all the Central American aborigines, and whose descendants still form the bulk of the population. There are numerous splendid ruins of their ancient cities, notably those of Uxmal, 40 miles south of Merida, Izamal, east of Merida, and Chichen-Itza, south-east of Merida. The Spaniards first entered the country in 1506, and during 1527-42 they effected its conquest. It became independent along with Mexico in 1821, but in 1840 a revolt against Mexican authority took place. The capitals of the states of Yucatan and Campeche are Merida and Campeche respectively, and among other towns are Sisal, Izamal, Valladolid, Tixcotob, Progreso, and Bacalar. Area of the two states together, 53,290 square miles; with British Honduras, 60,852 square miles.

**YUCCA**, a genus of plants of the natural order Liliaceae, with a woody, tree-like, mostly simple stem, surmounted by a crown of linear-lanceolate, more or less rigid leaves, from the centre of which rises a tall erect panicle of showy whitish flowers. They are natives of Central America, Mexico, and the southern United States, but have been acclimatized in Britain and other countries. In Britain they grow slowly in the open air, and do not flower often. The principal species are *Y. gloriosa*, of the southern Atlantic states of America, with a stem sometimes 3 feet long, and a flower-panicle sometimes 6 feet in length; *Y. aloefolia*, of the West Indies, Mexico, and North Carolina; *Y. brevifolia*, of the United States, whose stem may be 30 feet long.

**YUGA**. See AGE.

**YUKON**, a large river of North America, rising in British Columbia about lat. 59°, and entering Behring Strait by many mouths about lat. 62°. It is formed, at Fort Selkirk in 63°, by the junction of

the Lewis and the Pelly, the former being in turn constituted by the junction of the Big Calmon and the Teslin (out of Teslin Lake). From Fort Selkirk it flows north-west with many windings to the Arctic Circle, receiving on the right the Stewart and the Klondyke (at Dawson), and on the left the White River, Sixty Mile Creek, and Forty Mile Creek. On the Arctic Circle, at the abandoned Fort Yukon, it is joined on the right by the Porcupine River, and thenceforward its course is generally south-west to its mouth. The chief tributaries of the lower Yukon are the Koyukuk on the right bank, and the Biorh and Tanana on the left bank. It is a broad, muddy stream flowing mostly through a marshy plain, and from October to June it is frozen up. Canoes and other vessels can navigate both the main river and its tributaries. Its total length is about 2200 miles, and its drainage area 331,000 square miles. It gives name to a provisional district of the Dominion of Canada, formed when extensive gold deposits were discovered in the valley of the Klondyke tributary. Its area is about 192,000 square miles, and its population in 1901 was 27,219.

**YULE**. See CHRISTMAS.

**YULE, SIR HENRY**, a distinguished geographer and Oriental scholar, the son of a major in the service of the East India Company, was born at Inveresk, near Musselburgh, in Midlothian, on May 1, 1820. Educated at the Edinburgh high-school, he entered the East India Company's military college at Addiscombe in 1837, and continued his military studies at Chatham in 1839-1840. In 1840 he was appointed to the Bengal Engineers, and during 1843-1849 he was engaged in irrigation work in the North-West (now United) Provinces, with intervals of military service in the campaigns against the Sikhs. Lord Dalhousie in 1855 appointed him under-secretary to the public works department. In the same year he served as secretary to Col. Phayre's embassy to Burma, and in 1858 he published an admirable Narrative of the Mission sent by the Governor-General of India to the Court of Ava in 1855. He enjoyed the favour of Lord Canning, but in 1862 he left India and returned home. In 1864 he took up his residence at Palermo, partly on account of his wife's health, but mainly in order to continue and extend the researches which led to the publication of his great work, *The Book of Ser Marco Polo, the Venetian, concerning the Kingdoms and Marvels of the East*, newly translated and edited, with notes, &c. (two vols., 1871). A new and enlarged edition was published in 1875. In 1875 he returned to England, and from that year almost to the date of his death he was a member of the Indian Council. He died in London on Dec. 30, 1889. He was created C.B. in 1863 and K.C.S.I. in the year of his death. His great work gained him the Founder's medal of the Royal Geographical Society, and on his death-bed he received intimation of his election as a corresponding member of the Institute of France. His other works include: a treatise on Fortification, which was used as a text-book; *Cathay and the Way Thither* (two vols., 1866), for the Hakluyt Society; *Notes on Hwen Thsang's Account of the Principalities of Tokharistan* (1872); *Hobson-Jobson: being a Glossary of Anglo-Indian Colloquial Words and Phrases, and of Kindred Terms*, &c. (1886), with A. C. Burnell; *The Diary of William Hedges* (three vols., 1887-89), edited for the Hakluyt Society, of which he was for many years president; introductions to Wood's *Journey to the Oxus* (1872) and Przhevalsky's *Mon-golia* (1876); &c.

**YUNNAN**, the most south-westerly province of China, abutting on Tongking and Burma; area, about

153,000 square miles. It is very mountainous in the north and west, and has a general slope towards the south-east. The central part is a plateau about 6500 feet above sea-level, dotted with lakes and surmounted by hills of red sandstone; but in the south the elevation of the land is much less. The province is traversed by several large rivers, principally the upper courses of the Yang-tse-kiang (called Kincha-kiang), the Si-kiang, the Song-ka or Red River, the Mekong, and the Salwin, but only the Song-ka can be regarded as of use for navigation within the province. The principal crops are rice, opium, and wheat, but tea, indigo, sugar-cane, cotton, earth-nuts, and many vegetables are also cultivated. Cattle, sheep, hogs, and other animals are reared in considerable numbers, and silkworm-rearing is also extensively carried on. The chief wealth of the province, however, lies in its immense mineral resources, which include iron, coal, copper, gold, silver, lead, tin, zinc, cinnabar, and precious stones. The manufacturing industries include the making of silk goods and other textiles, leather goods, &c. The climate varies from the rigour of the northern districts, where the mountains are snow-capped for the greater part of the year, to the comparatively tropical condition of the south-east. A large part of the population consists of Miao-tse and other non-Chinese elements, and Mohammedanism has many adherents. The capital is Yunnan-fu, and other towns are Chaotung, Tali-fu, Momein, Ling-an-fu, Puerh, Tung-chwan, Mengtse, and Ssumao, the last two being open to foreign trade since 1889 and 1897 respectively. The British have endeavoured to establish a direct trade route between Yunnan and Burma, but from the physical features

of the region this is not easy. The history of Yunnan can be traced back to the third century B.C. Owing to its distance from the seat of the central authority and its mountainous character this province long remained practically independent. The most noteworthy event of its recent history is the great Panthay revolt of 1855, which was not suppressed by the Chinese authorities till 1873. Pop. estimated at 12,000,000.

YURUARI, a river of Venezuela, rising to the east of the Caroni and flowing eastwards to join the Cuyuni in about  $61\frac{1}{2}^{\circ}$  w. lon., near the frontier of British Guiana. The Yuruari territory was claimed by both Venezuela and Britain until 1899, when the award of an arbitration court gave most of it to Venezuela. There are several gold-fields here, including El Callao, &c.

YVERDON (German, *Ifferten*), a town of Switzerland, in the canton of Vaud, at the south-western extremity of Lake Neuchâtel. Its castle, built in 1135, was used by Pestalozzi as an educational establishment in 1805-25, and now contains a library and museum. The town has also a fine town-house, a hospital, and a memorial of Pestalozzi; and among the manufactures are railway wagons and materials, beer, &c. Yverdon was the *Eburodunum* of the Romans, and there are remains of the ancient walls. Pop. 7000, mostly French-speaking Protestants.

YVETOT, a town of France, in the department of Seine-Inférieure, on an elevated plain, 23 miles north-west of Rouen. It has manufactures of calico, hosiery, linen, leather, and baskets. Antiquaries have been much puzzled by an ancient chronicle, and still earlier edict, which gave the title of king to the lords of Yvetot. Pop. (1896), 7545.

## Z.

Z, the last letter of the English alphabet, is a sibilant, representing the sonant sibilant sound, the surd of which is represented by *z*, though *s* is often the sonant sibilant itself, as in *raisé*. Z has been introduced into the alphabets of Western Europe through the Latin alphabet, to which it was added in the time of Cicero from the Greek, though it had formed part of the earliest Latin alphabet. The *z* in German has a compound sound, corresponding to our *ts*; and modern German writers, therefore, omit the *t* formerly written before *z* in some German words. In Italian, where it usually takes the place of the Latin *t* in *ti* (as in *grazia*, *gratia*), it is sometimes sounded like our *ts*, sometimes like *ds*. In Spanish it corresponds to our *th* in *thin*. In French, when pronounced at all, it has the sound of a forcible *s*.

ZAANDAM, or SAARDAM, a town of Holland, 5 miles north-west of Amsterdam. It lies on a plain at a dam on the Zaan (by which it is intersected), whence its name. Its houses are mostly of wood, externally ornamented according to the taste of the possessor. The chief edifices are the town-hall, and the house occupied by Peter the Great of Russia during his eight days' residence here, when he came to study shipbuilding. He would not remain longer on account of the throngs of inquisitive spectators, and left for Amsterdam. There are corn, oil, and saw mills, paper and tobacco works. The shipbuilding and shipping trade have almost ceased to exist. Pop. (1900), 21,597.

ZABERN. See SAVERNE.

ZABIANS. See SABIANS.

ZACATECAS, a state of Mexico; area, 24,467 square miles; pop. (1900), 462,886. It is a mountainous and arid tract, with a rigorous climate, and very thinly peopled. The table-land, which forms the central part, rises to upwards of 6500 feet above the level of the sea. It has great mineral wealth, especially in silver, and some of its mines have been worked for centuries. The capital of the same name lies 290 miles north-west of Mexico, in a mountainous country, in the vicinity of some of the richest silver mines in Mexico. It is well built, and contains a college, with a valuable library, an hospital, a number of churches and convents, and a mint. Pop. (1895), 39,912.

ZACYNTHUS. See ZANTE.

ZAFFRE, an impure oxide of cobalt, obtained by roasting the ore till volatile bodies, such as sulphur and arsenic, are driven off. It is used in place of smalt (which see) for coarse ware.

ZAGAZIG, the chief town of the Egyptian province of Sherkiyeh, in the delta of the Nile, on the Muizz and Fresh-water Canals, connected by rail with Cairo, Alexandria, and Suez, 40 miles N.N.E. of Cairo. The great number of manufactories, with their tall chimneys, and the structure of the houses, give the place quite a European appearance, and testify to the industrial activity which here prevails. Nearly all the cotton grown in the eastern Delta is sent here to be cleaned, sorted, and partly spun



before being put on the market. The town is also a centre of the grain trade, and has rapidly increased in prosperity and population since its connection with Suez by the fresh-water canal. The ruins of the ancient Bubastis have been excavated in the vicinity. Pop. (1897), 35,715.

**ZAIRE.** See CONGO.

**ZAMBESI,** a river of South Africa, rising in Portuguese territory in lat.  $11^{\circ} 21' 3''$  s. and lon.  $24^{\circ} 22' E.$ , and reaching the Indian Ocean about lat.  $19^{\circ} S.$ , again in Portuguese territory, after a total course of 1650 miles, of which the middle part belongs wholly to Rhodesia. The Victoria Falls and the Kebra-basa Rapids, the former in the west of Rhodesia and the latter in Portuguese East Africa, above Tete, are regarded as dividing the river into three sections, the Upper, Middle, and Lower Zambesi. 'The neighbourhood of the source, with an altitude of about 5000 feet, is replete with bracken to all appearance similar to our British variety. The river itself has its origin in a deep depression at the base of steep undulations, where the water oozes from a black marshy bog and quickly collects into a well-defined stream' (Major Gibbins in the *Geographical Journal*, Feb. 1901). Another head-stream of the Zambesi is the Kabompo, which rises in the north-west of Rhodesia, about lat.  $11^{\circ} 34' S.$  and lon.  $25^{\circ} 17' E.$ , also at an altitude of 5000 feet, and in a region of open grassy downs. The former stream, at first known as Yambeshe and then as Liambai (Liambeshe), flows at first west with a southward tendency, and then turns S.S.E. Ten miles of rapids precede the Sapuma cataracts ( $13^{\circ} 7' S.$ ), where the river flows 'through a narrow rocky fissure into a pool of considerable extent'. At about  $14^{\circ} S.$  it is joined by the Kabompo from the north-east, and the remaining course of the Upper Zambesi has a south and south-easterly direction through the low-lying, grassy Marotse country, and is marked by various cataracts and rapids. Sesheke is a place of some importance on the left bank, near where the river begins to be wholly in British territory; and a short distance farther down, opposite Kazungula, it receives from the west the waters of the large tributary Kwando (Linyanti or Chobe). In about  $18^{\circ} S.$  there are the celebrated Victoria Falls, discovered by Livingstone in 1855. Here the broad river suddenly plunges into a transverse chasm from a height of 2600 feet to some 400 feet lower amidst a scene of tremendous grandeur. (See CATARACT.) The falls are now easily reached from Bulawayo, and a hotel has been built for visitors. The Middle Zambesi, whose direction is east, north-east, and again east, receives the Guay-Shangani and Sanyati from the south; the Kafukwe and Loangwa from the north, the latter at Zumbo, where the river leaves British territory; and is interrupted by various rapids and rocks, especially at low-water, the Kebra-basa Rapids being the first impassable obstacle to navigation from the mouth. The remaining course of the river (Lower Zambesi) has been described as, except for the Lupata Gorge, 'merely a broad expanse of sand, 3 to 5 miles wide, with low, reed-fringed banks, and intersected by numerous shallow streams'. It passes the town of Tete, below which it is joined on the right by the Mazoe, and after passing Sena it receives from the left the Shiré from Lake Nyassa, the water-way to British Central Africa. It enters the Indian Ocean by several mouths, of which the Chinde one is the most practicable. The total area of the basin is about 550,000 square miles. The Upper Zambesi was first explored by Livingstone, who reached the Liambai in 1851.

**ZAMIA.** See CYCADACEÆ in SUPP.

**ZAMORA,** a city of Spain, in Leon, capital of the province of the same name, 140 miles north-west of Madrid, on a rocky hill on the right bank of the Douro, here crossed by a fine bridge. It is the seat of a bishop, and the principal building is the cathedral, a Gothic structure, completed about 1174, but partially modernized in the Corinthian and Doric styles. Zamora played an important part in early Spanish history, and is renowned for the successful defence which it made against the Moors in A.D. 939. Pop. (1897), 16,453.

**ZANESVILLE,** a flourishing town of the United States, capital of Muskingum county, Ohio, on the Muskingum River, at the confluence of the Licking, and on several lines of railroad, 59 miles east of Columbus. The surrounding district is well cultivated and rich in minerals, and the rivers provide abundant power. The city is regularly laid out with broad streets on both sides of the river, communication between the banks being maintained by several bridges. It is lighted by gas and electricity, and has electric tramways. Among the chief buildings and institutions are the Athenæum, the county court-house, the market-house, the prison, the opera-house, &c.; besides numerous churches and schools. The manufactures are very varied. Pop. (1890), 21,009; (1900), 23,538.

**ZANTE** (ancient, *Zacynthus*), one of the Ionian Islands, in the Mediterranean, between 8 and 10 miles south of Cephalonia, and 15 miles from the nearest point of the Morea. It is about 24 miles long, 12 miles broad, and 60 miles in circuit; area, 277 square miles. It has the form of an irregular oblong, indented with a deep bay at its south-east extremity. The western half is hilly, rising to 2500 feet, and the west coast exhibits limestone cliffs. The east coast has a harbour, within which is situated the town of Zante (pop. in 1896, 14,906, a thriving and well-built place). Part of the island consists of an extensive fertile plain, having the appearance of one continued vineyard, with a few patches under cereals or pasture. The prevailing rocks are calcareous; gypsum appears in various parts, and a remarkable feature of Zante is its pitch-wells. Earthquakes frequently occur, and some 50 lives were lost in this way in 1893. The staple export of Zante is currants. The other chief exports are oil, soap, and a little wine; pomegranates, melons, peaches, oranges, citrons, and other fruits are grown, but the corn raised scarcely supplies three months' consumption. Goats are the only live stock. The island forms a nomarchy of the kingdom of Greece; pop. in 1896, 45,032.

**ZANZIBAR,** an island situated off the east coast of Africa, about 20 or 30 miles from German East Africa, opposite Saadani and Bagamoyo. It is of a somewhat oblong shape, with a length, north to south, of about 55 miles, and a breadth of 24 miles; area, 640 square miles. The island is of coralline origin in the main, and the adjacent waters are in many places obstructed by fringing reefs. A range of sandstone hills, attaining an elevation of 500 feet, divides the island into an eastern and a western half, the latter being well watered and extremely fertile, and the former lacking in surface water and comparatively barren. The slopes, which at a distance of 2 or 3 miles from the coast rise to a height of 300 to 400 feet, are covered with clove- and orange-trees; and the plains and valleys, watered by perennial streams, are clothed with rice, sugarcane, cassava, jowary, &c. The island is intersected in all directions by roads and green pathways. There are numerous small streams, which water the valleys, and the shipping and town of Zanzibar are now supplied with excellent water. The temperature

is very high in December and January, but the climate is not unhealthy. The population is of a very mixed character. The oldest inhabitants are a Bantu people, Wahadimu, living on the east coast, and now few in numbers. The Arab land-owners form the basis, and at the same time a kind of aristocracy, being proprietors of large plantations and numerous slaves, which latter constitute the great bulk of the population; there are likewise many natives of the Comoros, and of the west coast of Madagascar, and a considerable number of the natives from the coast of Hadramaut in Arabia. In 1873 the sultan abolished the slave-trade, which had hitherto absorbed the chief energies of the mercantile classes in his dominions. About 7000 natives of India are permanent residents, and their numbers increase yearly. All these native elements in the population are Mohammedans in religion. During the north-eastern monsoon the population is temporarily increased by several thousands by the arrival of traders, and the total population of the island is very variously estimated. It may be taken at about 230,000, of whom 60,000 belong to the town. The principal cultivated products are cloves, coco-nuts, sugar-cane, manioc, chillies, rice, oranges, areca-nuts, pepper, and tobacco, the last two in the eastern half of the island. Donkeys are reared, but few cattle. The fisheries are productive, especially on the east coast. The trade all passes through the capital, Zanzibar.

The town of Zanzibar lies mainly on a promontory almost in the middle of the west coast of the island. Like other eastern towns it is composed of narrow, crooked, and badly-made streets, which, never being cleaned except by flood-rains, are usually in a very filthy state. The principal buildings are the mosques, plain but substantial edifices erected in the same line as the houses; the two palaces of the sultan; the consulates; a fort and barracks; two European hospitals and an Indian one; a post and telegraph office; and Protestant and Roman Catholic missions. The bazaars are large, and well filled with articles of foreign manufacture. Nearly all the shopkeepers and workmen are natives of India. The chief palace of the sultan and the houses of the wealthier Arabs and foreigners lie close to the sea, opposite the harbour, and are generally flat-roofed, and have a court in the centre. The streets here are better laid and better kept, and are provided with a footpath. The town, being exposed to the sea-breeze and supplied with good water, is healthy. The harbour is very convenient, and secure at all seasons of the year. The value of the imports in 1901 was £1,196,831, the principal articles being piece-goods, rice, ivory, petroleum, ghee, hardware, coal, rubber, wheat, sugar, tobacco, live stock, beer, wines, spirits, hides, and gum copal. The total value of the exports in the same year was £1,168,518, the chief articles being piece-goods, cloves, copra, ivory, rubber, hides, gum copal, chillies, and sugar. The bulk of the imports came from British India, German East Africa, the United Kingdom, British East Africa, the United States, Germany, and Holland; and the exports were sent chiefly to German East Africa, British India, British East Africa, the United Kingdom, and the United States.

*History.*—The island of Zanzibar was for a long period the centre of an extensive East African empire, which embraced the island of Pemba and a considerable part of the coast of the continent. When the Portuguese penetrated to this coast in the fifteenth century they found several flourishing commercial towns, such as Zanzibar, Kilwa, Mombasa, Melinda, and Magadoxo. These were the head-quarters of petty Mohammedan rulers, but

most of them were soon conquered by the European invaders. Tyrannous government led to ineffective revolt, but finally, at the close of the seventeenth and the beginning of the eighteenth century, the Portuguese were expelled from most of the territory by the Imam of Muscat, to whom it became subject. The Imams maintained their authority over Zanzibar and its dependencies till 1856, when, on the death of the Imam Said his possessions were divided amongst his three sons, the African ones falling to Mejid as a separate sultanate. Mejid, who died in 1870, was an enlightened ruler, who gave much assistance to several eminent travellers. The reign of his successor, Bargash-ben-Said (1870–1888), witnessed the beginnings of German and English intrigue, and the first stage in the dismemberment of the sultanate and the suppression of the sultan. In the latter part of 1884 some German political agents concluded treaties with chiefs on the mainland, and the imperial government at Berlin forced the sultan to accept them. By the Anglo-German agreement of 1886 the sultan's dominions were delimited, and were recognized as including a strip of the coast, 10 miles broad, from Cape Delgado to Kipini, at the mouth of the Tana river. German authority was recognized in the hinterland of this tract from the Rovuma to the Umba, and British authority north of the Umba. The sultan was also recognized as ruler of the stations Lamu, Kismayu, Brava, Merka, Magadoxo, and Warsheikh, but the last four of these were ceded to Italy in 1892. In 1888 the German East African Association acquired administrative rights over the coast strip from the Rovuma to the Umba, and soon afterwards it was bought for a sum of four million marks and added to German East Africa. The Imperial British East Africa Company likewise acquired administrative rights over the coast strip from the Umba to the Tana. Another Anglo-German agreement in 1890 recognized Zanzibar and Pemba as a British protectorate, and the territory from the Tana to the Juba river as British. The coast strip is now included in British East Africa. The port of Zanzibar was declared free in 1892, but since 1899 a 5-per-cent *ad valorem* duty has been levied on imports. The joint area of Zanzibar and Pemba is 1020 square miles, the population being about 250,000. The legal status of slavery was formally abolished in 1897. The Maria Theresa dollar is the unit of the coinage issued under the sultan's authority, but the rupee is the chief current coin.

ZARA, a seaport town of Austria, capital of Dalmatia, on a promontory, which has been converted into an island by cutting through the narrow isthmus which formerly connected it with the mainland, 70 miles north-west of Spalatro. It was a fortress till 1878, and it still has four gates. It consists of several tolerably clean and well built, but steep and narrow streets; several squares; and has an ancient and interesting cathedral, in the Lombard style; several other churches; a town-house; a lyceum, gymnasium, archiepiscopal seminary, normal and other schools; a civil and a military hospital; and a capacious but somewhat shallow harbour, admitting warships of medium size. It has manufactures of roscoglio, maraschino, and glass, and some trade. Zara has stood many sieges, particularly one in 1202, when it was taken by the Venetian doge Dandolo, with the assistance of the French crusaders; and another in 1346, when it was taken by Marino Faliero in the face of a large Hungarian army. Pop. in 1890, 27,642; in 1900, 32,506.

ZARSKOJE-SELO. See TSARSKO-SELO.

ZEA. See MAIZE.

ZEA (ancient, *Cos*), an island of the Grecian

Archipelago, belonging to the group of the Northern Cyclades, 13 miles east of Cape Colonna. It is of a very compact and somewhat oval form; area, 74 square miles. Behind the coasts, which are generally low, the ground rises in fine terraces towards the centre, where it culminates in Mount St. Elias. The prevailing rock is limestone. The climate is salubrious, and the soil both fertile and well cultivated, producing in abundance barley, cotton, wine, and figs. The pastures also feed great numbers of cattle, and much attention is paid to the rearing of silk-worms. Pop. 5019.—Zea, the capital, is about 8 miles inland from the harbour, which admits the largest vessels and is well frequented. Pop. in 1896, 4657.

ZEALAND, or SEELAND, the largest of the Danish islands between the Cattegat and the Baltic, separated from Sweden by the Sound and from Funen by the Great Belt; area, with Möen and Samsø, 2793 square miles; pop. 833,702. It has no mountains; but the surface is finely variegated, having small hills and fields of a fertile soil, intersected by canals. It produces large crops of corn, and has excellent pasture. Besides several other towns of considerable importance, it contains the fortress of Elsinore or Helsingør, and the capital and royal residence, Copenhagen.

ZEBRA, the name of several animals, natives of Africa, belonging to the family of the Horses. The zebra belongs to the same general type as the ass, with which it may be regarded as constituting a genus *Asinus*, distinguished from *Equus* (the horse) proper by possessing a dorsal line or dark marking along the spine, and by having the body more or less banded. The fore-legs only possess the 'warts', seen in both fore- and hind-limbs in the horses; and the tail is 'tufted'. As in all Equidæ the feet each possess a single—the third—toe only, the other toes being abortive or rudimentary. The typical zebra (*Equus* or *Asinus zebra*) inhabits South Africa, but it is now almost extinct. A few specimens, however, are strictly preserved in the mountainous districts of eastern Cape Colony. The body is cream-coloured, its characteristic bands being of a deep black. The stripes are drawn at right angles to the axis of the body. The legs are striped right down to the hoof, but the under part of the body has no stripes. The neck bears a faint development of skin or dew-lap, and the mane is very short. The animal was long considered untamable, but experiments made since 1872 have shown that with proper treatment it can be made to work well in harness. It is timid and wary, whilst its speed and endurance are proverbial. The Dauw, or Burchell's Zebra (*Equus Burchelli*), is higher and more graceful than the true zebra. It is striped on the belly, but usually not on the lower part of the legs. It has been driven northward, and is now rare even in the Transvaal. Chapmann's Zebra (*E. chapmanni*) is another variety, found from Bechuanaland north to the Soudan. Grévy's Zebra (*E. Grévyi*) is restricted to Abyssinia and Somaliland. The Quagga (which see) is a near ally of the zebras. See Pl. I., fig. 12, at UNGULATA.

ZEBU. See OX.

ZECHARIAH, a Hebrew prophet who, along with Haggai, stimulated the Jews to rebuild the temple after the return from captivity under Zerubbabel and Joshua, in the reign of Darius I. (Hystaspes, 522-485 B.C.) of Persia. Of the prophetic book bearing his name, the second last of the Minor Prophets, only the first eight chapters are by him. These are divided into three sections, namely: (1) i. 1-6, a sort of preface, dated the eighth month of the second year of Darius; (2) i. 7-vi. 15,

the most important, consisting of eight visions interpreted by an angel, dated the twenty-fourth day of the eleventh month of the second year of Darius; (3) vii.-viii., dated the fourth day of the ninth month of the fourth year of Darius, dealing with the continued observance of the fast-days of the captivity. The remainder of the book, ix.-xiv., is by many ascribed to the Assyrian period, but some critics (e.g. Wellhausen) regard it as much later in date.

ZEDEKIAH, the last King of Judah of the line of David, was the son of Josiah and Hamutal. His original name was Mattaniah. When he was twenty-one years of age Nebuchadnezzar appointed him to succeed his nephew Jehoiachin (whom he carried to Babylon) as King of Judah (about B.C. 599), and changed his name to Zedekiah. He took an oath of allegiance to Nebuchadnezzar, which he afterwards broke, and entered into a league with Egypt against him. His conduct in so doing was denounced by Jeremiah the prophet, who, as well as Ezekiel, who was then in Chaldæa, predicted the approaching fall of Jerusalem. Jerusalem was besieged by Nebuchadnezzar and taken in B.C. 588. The temple and city were destroyed and the leaders of the Jews carried captive. Zedekiah, whose sons were killed in his presence, had his eyes put out, and was carried to Babylon, where he died. The time of his death is unknown. His history is recorded in the books of Kings and Chronicles, and more fully in Jeremiah.

ZEDOARY (*Curcuma Zedoaria*), a plant of the order Zingiberaceæ or Gingerworts, distinguished, like ginger, for the stimulating and aromatic properties of the root. It is a native of India and China. The roots of several other species, particularly *Curcuma zerumbet*, are sold under the same name.

ZEELAND, or SEELAND (Sealand), a province of Holland, bounded south by the Kingdom of Belgium, and west by the North Sea; area, 680 square miles. It consists of a low-lying tract of land on the frontiers of Belgium and on the southern shore of the estuary of the Schelde, and of the islands of Walcheren, North and South Beveland, Schouwen, Tholen, &c., separated from each other and from the mainland by arms of the Schelde, from which and from the North Sea it is protected by dikes. As a whole the province is flat and fertile, producing excellent crops of the ordinary cereals, a considerable quantity of clover, rape, and madder, and a superabundance of excellent fruit. The grass lands also are rich and extensive. The climate is rather moist, but comparatively healthy. Large tracts partially covered by the sea have in recent times been successfully reclaimed. The capital is Middelburg, in the Island of Walcheren. Pop. (1900), 217,329.

ZEGEDIN. See SZEGEDIN.

ZEIJST, ZEIST, or ZEYST, a village of Holland, in the province of Utrecht, and 6 miles east of the town of that name, chiefly remarkable for a Moravian establishment, to which belong a 'brothers' house', a 'sisters' house', a 'widows' house', and various workshops, warehouses, and residences. There are manufactures of soap, candles, vinegar, &c. Pop. over 7000.

ZEITZ, a town of Prussia, in the province of Saxony, 22 miles S.S.W. of Merseburg, on the White Elster, here crossed by several bridges. It has several churches; a gymnasium, with a library, in a former Franciscan monastery; other educational institutions; hospitals; and there are manufactures of iron, woollens, cottons, gloves, machinery, cigars, sugar, pianofortes, cycles, &c. Pop. (1900), 27,391.

ZEMINDARS, a class of officials created under

the Mogul government of India, about whose functions there has been much controversy. They have been regarded, first, as district governors possessed of a standing and authority similar to that of feudal counts or dukes; second, as landed proprietors; third, as farmers or collectors of the government revenue on land. The functions of the zemindars appear to have been to a great extent arbitrary and variable, but founded on and arising out of the last-named office. On the transference of the authority of the moguls to the East India Company the zemindars were in general treated as the proprietors of land; but this is usually considered by those who have studied the question of Indian land tenure to have been a mistake founded on western notions. The term zemindar is of Persian origin, and the office probably originated with the Mohammedan conquerors of India, who claimed the soil of the country, but, leaving the Indian village tenure intact, set these officers called zemindars over districts comprising each a certain number of villages, the head men of which accounted to them for the revenues of the land which they collected, with a liberal profit to themselves. Like all systems of farming the revenue this arrangement necessarily became oppressive. The ryot or cultivator had over him the havildar or head man of his village, the zemindar, and the nabob or political ruler, under the Mogul emperor—all of whom, whether nominally proprietors of the land or not, robbed him of the produce of his toil. In substituting a simple system of proprietary and taxation for this hierarchy of oppression, whatever temporary injustice may have been done through ignorance of theoretical rights, it can hardly be doubted that a substantial benefit was ultimately conferred on the people of India as a whole. See INDIA—Land Revenue and Land Settlement.

ZEND, more correctly *Avestan*, an ancient Iranian language, in which the Zend-Avesta is composed. This language was first introduced to notice by Anquetil Duperron, and the accurate knowledge of it has been developed among others by Rask, Burnouf, Bopp, and Haug. It is now recognized to be a coeval and cognate dialect with the Vedic Sanskrit. It embraces two dialects called Bactrian, in contradistinction to the ancient languages of Media and Persia, which are called the Western Iranian, while the Zend or Bactrian dialects are called the Eastern Iranian dialects. The two Zend dialects consist of an earlier and a later, analogous to the Vedic and classic Sanskrit or to the Homeric and classic Greek. The period of transition between them is perhaps from 100 to 200 years. The earlier dialect is called the Gâtha, from the Gâthas or sacred songs which form the only remains of it; the later is that in which the greater part of the Zend-Avesta or Zoroastrian sacred writings are found. Both of these dialects had died out about three centuries before Christ, and the difficulty of studying them is greatly increased by frequent copying by persons unfamiliar with their forms. They differ both in grammar and pronunciation, they are both highly cultivated languages and rich in inflections, but the earlier is richer in inflections and the later in compounds. The earlier is distinguished by long vowel terminations, probably produced by transcribing the singing pronunciation of the gâthas. The present alphabet is comparatively modern, and is probably derived from the Syriac. There are twelve simple vowels, fourteen diphthongs, and twenty-nine consonants, represented by separate characters. The roots are mostly monosyllabic, some consisting only of a single vowel, others of a vowel and consonant or a vowel between two consonants. These primitive

roots are modified by articulate additions, which extend or limit their meaning after the manner of prefixes and suffixes; thus *dâ*, to make, with the addition of *h*, becomes *dâh*, to place. Verbal roots undergo modifications producing three distinct forms, the causal, the desiderative, and the intensive. Verbs have three voices, active, middle (reflective), and passive; and four moods, indicative, subjunctive, potential, and imperative. Some of these moods are double. The tenses include one for the present, four for the past, and two for the future. Nouns are formed from roots by means of suffixes. There are three genders, masculine, feminine, and neuter. There are also three numbers, singular, dual, and plural, with eight inflections in the first and last and five in the middle number. The forms of the declensions closely resemble those of Sanskrit; and there are many other analogies between the Gâtha dialect and the Vedic Sanskrit.

ZEND-AVESTA, or simply AVESTA, the sacred books of the Zoroastrians, Magians, Guebers, or Parsees. The meaning now commonly attached by scholars to these words is *avesta*, text, and *zend*, translation, or commentary with paraphrase. The writings comprehended in the Zend-Avesta were of vast extent, and comparatively small fragments of them now remain. At a period before Zoroaster, the two religions which subsequently developed into Brahmanism and the dualistic religion of Persia, appear to have been one. When a separation and alienation occurred in the Iranian family the common religion took different developments, and ultimately the gods of one section became the devils of the other. The time of the appearance of Zoroaster is not definitely fixed, but the state in which he found the Iranian religion was evidently transitional. He seems to have been a man of great capacity, and actuated by the highest views. The religion he founded was a monotheism based on philosophical speculation, which, through the misapprehension of subsequent commentators, developed into the dualism of opposing deities, which became the popular creed of the Persians. (See ZOROASTER.) The Parsees attribute all their sacred writings to Zoroaster, but the name is in this connection to be understood collectively, or rather perhaps in a representative sense. Zoroaster or Zarathustra was the official designation of the successors of the first Zoroaster, whose own name was Spitama. They may, therefore, be regarded as speaking in his name and by his authority. All their recorded sayings were regarded as sacred. The *Yazna*, a sort of sacrificial ritual, consisting of prayers and hymns, contains the five Gâthas in the older dialect, which are ascribed to Zoroaster himself. They bear the title 'The Revealed Thought, the Revealed Word, The Revealed Deed of Zarathustra, the Holy; the archangels first sang the Gâthas.' There is a later *Yazna* written in the younger dialect. The *Visparad* is a collection of sacrificial prayers in later Zend, similar to the younger *Yazna*. The *Yashts* are later collections of prayers, consisting of particular invocations of angels, &c., mixed with legends. The *Vendidad* contains the religious, civil, and criminal code of the Zoroastrians. It exists only in a very imperfect state, and is accompanied with a *zend* and *pâzend*, or earlier and later commentaries, not always consistent, which are all now deemed authoritative. It enumerates sixteen Aryan countries which acknowledged the Zoroastrian religion. There is also a Pehlvi compilation of Zoroastrian doctrine called the *Bundehesh*.

Exclusively of some of the sections already mentioned, the whole Zend scriptures are reckoned to have consisted of twenty-one *noaks* or *parts*, each consisting of *avesta* and *zend*. Only one of these,

the twentieth, which is ceremonial, and consists of twenty-two chapters on the removal of impurities, is now extant in a complete state. There are some fragments of the other parts, particularly of the fourth, which treats of the present and future states of existence, and of the eleventh, which narrates the propagation of religion by a convert King Guahāsp. The immortality of the soul, a future state of rewards and punishments, and the resurrection of the body, are taught in the Zend religion. The names of all the noaks survive, generally with some account of their contents. They treat of every variety of subject, theology, philosophy, natural science, law, religious ceremonial, and history.

ZENGG, or SZENY, a seaport town of the Austrian Empire (Croatia-Slavonia), on the Canale della Morlacca of the Adriatic Sea, opposite Veglia island, 32 miles south-east of Fiume. It is the see of a bishop and has a handsome cathedral. It carries on a trade in corn, honey, wax, oil, fish, &c. Pop. 3000.

ZENITH, an Arabic word, used in astronomy to denote the vertical point of the heavens, or that point of the heavens directly over the head of the observer. Each point on the surface of the earth has therefore its corresponding zenith. The zenith is called the 'pole of the horizon,' as it is 90° distant from every point of that circle. See NADIR.

The *zenith distance* of a heavenly body is the arc intercepted between the body and the zenith, being the same as the co-altitude of the body.

ZENO OF ELEA, an early Greek philosopher, was the favourite disciple of Parmenides, whose opinions he defended, and whose ethico-political schemes he shared. He was born about 500 or 490 B.C. He appears to have lived for a considerable time in Athens, where he taught for remuneration, and had distinguished pupils, as Pericles and Callias. He engaged in an enterprise on behalf of his native land against a tyrant, who is variously named as Nearchus or Diomedon. Whether he perished in this attempt or survived is not known. None of his writings are extant, but his opinions are referred to by Aristotle, who attempted to confute some of them, and who has distinguished him as the inventor of dialectic. In Plato's dialogue of Parmenides a treatise of his is alluded to, in which various hypotheses are treated on the principle of *reductio ad absurdum*. As a defender of the Eleatic doctrine of the unity of the existent, he was the first to lay down the problems of scepticism in regard to the real existence of the phenomenal world, and has thus exercised an important influence on philosophy. He is said to have directed four arguments against the reality of motion, first from the impossibility of a moving body arriving at a place without passing through an infinite number of intermediate places; second, from the contradictoriness of relative notions of speed, based on the same reason; third, from the fact that each body at each particular moment must occupy one particular portion of space, and is therefore at rest; fourth, from the contradictoriness of relative notions of time in respect to motion, the same portion of time being regarded as long or short, according as it is measured by different standards. He is also credited with an argument against the veracity of sensuous impressions, which rests merely on an imperfect knowledge of physics. It is in this form. If a measure of millet-grains in falling produces a sound, each single grain, and each fraction of a grain, however minute, must also produce a sound; for as the results of the motion of the whole mass is but the sum of the results of the motion of its parts, if no sound is produced by the smallest of the parts, no sound can be produced by the whole.

ZENO, of CITIUM, founder of the Stoic school

of philosophy, was born at Citium, a city of Cyprus. The circumstances of his life are not well known. He is reported to have lived to a great age, according to Apollonius ninety-eight years, during fifty-eight of which he taught. Persaeus makes him live only seventy-two years, but as a letter of Zeno is cited, in which he calls himself eighty years of age, it has been conjectured that this should read ninety-two. He is said to have lived till the 130th Olympiad, or B.C. 260. The time he is reported to have studied philosophy before beginning to teach is twenty years, and it is also said that he came to Athens in his twenty-second or thirtieth year, after suffering shipwreck, and according to one account losing his all, while by another his wealth amounted to 1000 talents. At Athens he early made himself remarked for the virtues of moderation and contentment, and during his long life he so acquired the esteem of the citizens that they voted him a crown of gold and a public burial in the Cerameicus, because he had conducted young men in paths of virtue and discretion. He is said to have declined the citizenship of Athens from fidelity to his native country. He is said to have been first induced to live abstemiously from weakness of body, and to have afterwards adopted the habit from desire of independence. He first resorted to the teaching of the Cynic Crater, and by this school his own views, especially in the earlier period of his career, were much influenced. It may seem surprising that Zeno, who rejected both the contempt for established usages and for general knowledge which distinguished the Cynics, should have attached himself to that school, but the central point of every true system of philosophy is its ethics, and he was attracted to the Cynics by their doctrines of moral obligation, which he made the foundation of his own system. Contrary to the advice of Crater he afterwards studied under Stilpo the Megarian. Among his subsequent advisers or teachers are enumerated the Megarians Cronus and Philon, and the Academics Xenocrates and Polemon. Of the last two he is said to have been a pupil. He maintained a friendship with Antigonus Gonatas, king of Macedonia, of whom his disciples Persaeus and Philonides were companions. He opened his school in the Porch (Stoa) after he had gained some pupils. This place, which was adorned with paintings by Polygnus, had formerly been the resort of a school of poets, who were from this circumstance called Stoics, and the name was now transferred from them to the disciples of Zeno, who at first had been called Zenonians. All the works of Zeno are lost. They were numerous, and include treatises On the State (early and of cynical tendencies), On the Ethics of Crates, On Life according to Nature, On Impulse, On the Nature of Man, On the Affections, On the Becoming (or Fitting), On Law, on Grecian Education, various treatises on physics, logic, and poetry, and a work on the Pythagorean doctrine. Concerning the doctrines of Zeno we have not here to speak, as they have been already discussed in the article STOICS.

ZENOBIA, Queen of Palmyra, claimed her descent from the Macedonian kings of Egypt. She was instructed in the sciences by the celebrated Longinus, and made such progress that, besides her native tongue, she spoke the Latin, Greek, and Syrian languages. She also patronized learned men, and herself formed an epitome of Egyptian history. She was married to Odenatus, king of Palmyra, and accompanied him both in the war and the chase; and the success of his military expedition against the Persians is, in a great degree, attributed to her prudence and courage. Gallienus, in return for services which tended to preserve the East to the Romans after the capture of Valerian by Sapor,

king of Persia, acknowledged Odenatus as emperor; and on his death, A.D. 267, she assumed the sovereignty, under the title of Queen of the East. She preserved the provinces which had been ruled by Odenatus, and was preparing to make other conquests, when the succession of Aurelian to the purple led to a remarkable change of fortune. That martial prince, disgusted at the usurpation of the richest provinces of the East by a female, determined to make war upon her: and having gained two battles, besieged her in Palmyra, where she defended herself with great bravery. At length, finding that the city would be obliged to surrender, she quitted it privately; but the emperor, having notice of her escape, caused her to be pursued with such diligence that she was overtaken just as she got into a boat to cross the Euphrates, in 273. Aurelian spared her life, but made her serve to grace his triumph, in 274. The Roman soldiers demanded her life; and according to Zosimus she purchased her safety by sacrificing her ministers, among whom was the distinguished Longinus. She was allowed to pass the remainder of her life as a Roman matron; and her daughters were married by Aurelian into families of distinction. Her only surviving son retired into Armenia, where the emperor bestowed on him a small principality.

**ZENTA.** See **ZSENTA**.

**ZEOLITES**, hydrated double silicates, chiefly of aluminium and calcium.

**ZEPHANIAH**, one of the twelve minor prophets, was a descendant, in the fourth degree, of Hizkiah, who is generally supposed to be Hezekiah, the king of Judah. He prophesied in the reign of Josiah. His prophecy, which is short, contains denunciations against Judah and the surrounding nations for idolatry, ending with a Messianic prophecy of deliverance to the Israelites.

**ZEPHYR**, a soft, cool, agreeable wind; in Greece the west, or rather west-south-west wind. The Greek name, according to the etymology, signifies *life-bringing*, because at the time when this wind begins to blow, the plants are restored to life by the balmy spring air.

**Zephyrus**, according to the Grecian mythology as well as that of the Romans, was one of the inferior deities—a son of Æolus, or of Astræus and of Aurora, a lover of Chloris or Flora. By the harpy Podarge he was the sire of the swift horses of Achilles, Xanthos, and Balios. His love being rejected by Hyacinthus, he was the cause of his death by blowing Apollo's quoit against his head. Some make him the husband of one of the Hours. Flowers and fruits are under his protection. He is represented as a gentle beautiful youth, naked, with a wreath on his head, or flowers in the fold of his mantle.

**ZERDUSHT.** See **ZOROASTER**.

**ZETHUS.** See **AMPHION**.

**ZEUGLON.** See **CETAE**.

**ZEUS**, in Greek mythology, the chief of the Olympian gods, called the father of gods and men. He was the son of Cronos and Rhæa. Cronos was the son of Uranus, and Uranus of Gæa (the Earth), the first being who sprang from Chaos, or infinite and vacant space. According to the myth Cronos was in the habit of swallowing his children immediately after their birth. When Zeus was about to be born Rhæa consulted Uranus and Gæa as to how he might be saved, and they sent her to Crete (the Trojan Ida and other places are mentioned in other accounts) to be delivered. She concealed Zeus in a cave in Mount Ida, and gave Cronos a stone wrapped up in a cloth to swallow. The infant Zeus was tended by the nymphs Ida and Adrastea; he was supplied with milk by the goat Amalthea, and the bees gathered

honey for him. When he had reached manhood, by the aid of Gæa or Métis he persuaded his father to restore to the light the children he had swallowed. Zeus now united with his brothers to dethrone his father, a change of government which led to a war with the Titans. This struggle was not terminated until Zeus delivered the Cyclopes, sons of Uranus and Gæa, who had been bound by Cronos, and who in return provided him with thunder and lightning, and also liberated the hundred-handed beings Briareos, Cottos, and Gyges, who likewise lent him their aid. Having vanquished the Titans, the other children of Uranus and Gæa, he shut them up in Tartarus. Tartarus and Gæa now begot another monster, Typhæus, who engaged in a fearful struggle with Zeus, but was finally vanquished by a thunderbolt. Zeus now obtained the dominion of the world, which he divided by lot with his brothers Poseidôn (Neptune), who obtained the sea, and Hadês (Pluto), who received the lower world. Zeus himself possessed the heavens and the upper regions, while the earth was held as common property. Another dreadful war was now waged against the Olympian gods by the giants who were sprung from the blood of Uranus. In this struggle the gods were assisted by Athênê, Apollo, Heracles, and other children of Zeus, and the giants were completely vanquished. Zeus had three sisters as well as three brothers, namely, Hestia (Vesta), Dêmêtêr (Ceres), and Hêra (Juno). He first married Métis, a daughter of Oceanus and Têthys; but as Fate had prophesied that she should bear a son who should rule the world, Zeus swallowed her when she was with child, and Athênê subsequently sprung from his head. As his second wife he took for a time Themis, daughter of Uranus and Gæa, but his final and best beloved wife was his sister Hêra, by whom he had Hêbe, Arês, and Hephestus. His amours, both with goddesses and with mortal women, were numerous, however, he having been the father of Apollo and Artemis by Lêtô, of Aphroditê by Dionê, of Hermês by Maia, of Bacchus by Semelê, of Heracles by Alcmenê, &c. The twelve principal Olympian gods, who were worshipped by the Greeks in a body, were Zeus, Poseidon, Apollo, Arês, Hermês, Hephestus, Hestia, Dêmêtêr, Hêra, Athênê, Aphroditê, and Artemis. These gods were identified by the Romans with their own deities, Zeus being considered the same as their Jupiter, and the legends connected with the former being transferred to the latter. Zeus was regarded as the founder of law, order, and authority, the avenger of wrongs, the punisher of crime, the rewarder of good actions, the source of prophetic power, the author of all good things, and, in short, as the omnipotent, all-wise, and benevolent ruler of the universe. He was especially looked upon as the controller of all the phenomena of the heavens, and was constantly spoken of as the 'Cloud-gatherer' or the 'Thunderer.' Notwithstanding his general character of wisdom and benevolence, his conduct was anything but immaculate. The incongruity struck some of the ancients themselves, and led to protests against such stories being believed. One of the most prominent of the theories advanced to explain these stories is that of Max Müller and Sir G. W. Cox, of which an account will be found at **MYTHOLOGY**. Hêra frequently rebelled against his amours, but was compelled to submit, which she sometimes did suddenly enough; and the other gods, sometimes in league with her, sometimes with one another, brought themselves into occasional trouble by abortive conspiracies against their great ruler. Hephestus, who sometimes intervened in the quarrels of his father and mother, was twice thrown out of heaven. Even Athênê, during the siege of Troy, forgot her prudence



so far as to turn against her father, who favoured the Trojans too much against her beloved Greeks. These quarrels always ended in the reassertion of the authority of Zeus, who, however, like other heads of families, had occasionally to give up the object contended for. There appear to have been various local gods of the same name, with various attributes and legendary histories, who were finally merged in the national Hellenic Zeus; traces of the original traditions, however, remained in the local rites of particular localities. An Arcadian and a Cretan Zeus are particularly distinguished. The former had a temple at Zeus Lyceus, so sacred that if any one entered it he died within twelve months, while intentional trespassers were stoned to death. In Crete there were many places sacred to Zeus, who had passed his early life there, particularly Mount Ida and the district around it. Zeus also landed on the island at Gortyn in the shape of a bull, when he carried off Europa, and was worshipped there by the surname of Hecatombeus. The national god was worshipped by sacrifices of bulls, cows, and goats. Two of the principal localities where his worship was carried on in Greece were Athens and Olympia. At the latter place the Olympic games, the most splendid festival in Greece, were held in his honour. (See OLYMPIC GAMES.) Here there was a magnificent temple and a gold and ivory statue of the god, the work of Phidias. It was 40 feet high, and was reckoned one of the seven wonders of the world. In representations of Zeus the attributes in connection with him are the eagle, the sceptre, and the thunderbolt. He is represented sometimes with Hera by his side, sometimes with Athena, or with both, or with Athena and Heracles. On ancient painted vases he is often seen, thunderbolt in hand, driving in a chariot, attended by the other gods.

ZEUXIS, a celebrated Greek painter. He was a native of Heracleia, but which town of that name was his birthplace is not certain. He was born about the middle of the fifth century before Christ, and flourished probably about B.C. 424-397. He is said by some authorities to have studied under Demophilus of Himera, by others under Neseas of Thesos. He also studied at Ephesus. He belonged to the Asiatic or Sensuous school of painting, the distinguishing quality of which was accurate imitation and the gratification of taste by the representation of physical beauty. Aristotle says that an elevated conception of character was wanting in his work, while Cicero praises him along with Polygnotus and Timantes for *formæ et lineamenta*. He learned from Apollodorus the treatment of light and shade, and from Phidias to take Homer's descriptions of his heroes as ideal models and to paint them with limbs larger than the ordinary human proportion. He travelled much in prosecution of his art in Greece, Macedonia, Italy, and probably Sicily, acquired much wealth, and made at times an ostentatious display of it. One of his most famous works was a picture of Helen for the temple of Juno at Croton. He selected for his model five of the most beautiful virgins of Croton, whose various perfections he endeavoured to combine in his work. The names of the virgins have been preserved, and the picture has been made the subject of poetry. The rivalry of Zeuxis and Parrhasius is represented in a well-known story about a contest in which Zeuxis painted grapes at which the birds pecked, and Parrhasius a curtain which Zeuxis wished to have raised in order to see the picture. Another celebrated picture of Zeuxis was lost at sea while being transported to Rome. Lucian saw and described a copy of it. It represented a female hippocentaur in a posture of

repose suckling her young. The upper part of the body represented a perfect female form and the lower a beautiful Thessalian mare, so skilfully united that the point of junction could not be detected. The male centaur—a savage, shaggy creature—was holding a lion's cub in sport to frighten the young, which were looking at it with baby curiosity and clinging to their mother. Another celebrated picture represented Zeus throned among the gods.

ZILLEH, or ZILE (ancient, *Zela*), a town in the north of Asiatic Turkey, in the vilayet of Sivas, 25 miles south by east of Amasia. It is built on a hill, and has a modern castle on the site of an old Byzantine fortress. Pop. 20,000.

ZIMBABWE, or ZIMBABWE, a Bantu word meaning, according to Mr. Bent, 'Here is the great kraal', applied to numerous ruins of great interest in Southern Rhodesia and the Transvaal. The best known and most important of these is the Great Zimbabwe, near the Sabi River, about 17 miles from Victoria in Southern Rhodesia. The principal structures at Great Zimbabwe are two, one on the crest of a granite hill breaking down precipitously to the south, and the other on the level ground about a third of a mile to the south. The lower one is roughly circular or elliptical, inclosed by a wall of 30 or 40 feet high, 14 feet thick at the base, and from 6 to 9 feet thick at the summit. The wall is composed of well-trimmed blocks of granite fitted together without mortar in regular courses, and occasionally set angularly for ornamental purposes. An inner wall runs close to the outer for a considerable distance, forming a passage which leads to a sacred inclosure containing two conical solid towers, the larger of which is some 40 feet high. The rest of the inclosure is divided into irregular chambers, none of which are roofed. The building on the hill is very strongly built for defence, and also contains a sacred inclosure. Phallic emblems, many curious objects in soapstone, and undoubted remains of gold-working utensils have been found in the Zimbabwe. The nearest gold deposits and ancient gold workings are, however, some miles distant. It is generally believed that the lower building was a kind of town occupied by pre-Mohammedan Arabs who came here in search of gold, and that the ruin on the hill was a stronghold for defence. The buildings show distinct signs of orientation. See Bent's *The Ruined Cities of Mashonaland* (1892) and Hall and Neal's *The Ancient Ruins of Rhodesia* (1902).

ZIMMERMANN, JOHANN GEORG, CHEVALIER VON, physician and writer, was born in 1728 at Brugg, in the canton of Aargau (then in Bern), Switzerland. After receiving a regular education he repaired to the University of Göttingen, where he studied medicine under Haller, and soon after he was appointed public physician to his native town. He employed his leisure in the publication of pieces in prose and verse, including the first sketch of his popular work *On Solitude*. This was followed by his essay *On National Pride*. In 1763 he composed his work *On the Experience of Medicine*, which he followed up by several other professional treatises; in consequence of which he received an offer of the post of physician to the King of England for Hanover, which he accepted, and removed in 1768 to that capital. His work *On Solitude* was published in four vols. octavo. In 1786 he attended Frederick in his last illness, which afforded little room for medical skill, but enabled him to publish an account of his conversations with that celebrated sovereign: *On Frederick the Great, and my Conversation with him shortly before his Death* (Leipzig, 1788), and *Fragment on Frederick the Great—works which did not*

increase his reputation. He also undertook a defence of that prince from the censures of Mirabeau, which writings exposed him to severe criticism. His mind was further disquieted by the part which he took in the controversies which arose out of the discussions that led to the French revolution. The constitutional melancholy to which he was subject finally ended in complete mental derangement. He died 7th October, 1795. Most of his works have been translated into English; and his Solitude was at one time very popular. His writings towards the end of his life almost destroyed the reputation which he had earned at an earlier period.

ZINC is a metal of a bluish-white colour, somewhat brighter than lead, of considerable hardness, and so malleable as not to be broken with the hammer, though incapable of much extension in this way. It is a very useful metal, and since the early part of the nineteenth century the purposes for which it is employed have become numerous. Zinc has the symbol Zn and the atomic weight 65.4. At a temperature between 212° and 300° Fahr. it is both malleable and ductile. Its specific gravity varies from 6.9 to 7.2. When broken by bending, its texture is seen to be coarsely granular. On account of its imperfect malleability it is difficult to reduce it into small parts by filing or hammering; but it may be granulated, like the malleable metals, by pouring it, when fused, into cold water; or if it be heated nearly to melting it is then sufficiently brittle to be pulverized. It melts at about 790° Fahr., and soon afterwards becomes red-hot, burning with a dazzling white flame, and with the production of finely-divided oxide of zinc, formerly called *flowers of zinc*, or *philosophical wool*. This, the only oxide of zinc, is a powerful base, called *zinc white* in commerce, and having the formula ZnO. At common temperatures it is white; but when heated to low redness it assumes a yellow colour, which gradually disappears on cooling. It is quite fixed in the fire, and insoluble in water. It combines with acids to form salts, most of which are colourless. It combines also with some of the alkalis. *Chloride of zinc* (ZnCl<sub>2</sub>) is a soft, easily fusible solid formed by burning the metal in chlorine; it is sometimes known by the name of *butter of zinc*. Bromide and iodide of zinc may be formed by processes similar to those for preparing the analogous compounds of other metals. *Sulphide of zinc* may be formed by adding an alkaline sulphide to a solution of a zinc salt. This substance, as found in nature, is described below among the *ores of zinc*. The salts of zinc generally yield colourless solutions with water in which potassium ferrocyanide, sulphuretted hydrogen, and alkalis occasion white precipitates; infusion of galls produces no precipitate. *Sulphate of Zinc* (ZnSO<sub>4</sub>, 7 H<sub>2</sub>O) may be formed by dissolving metallic zinc or its oxide in dilute sulphuric acid, but it is more extensively manufactured from the native sulphide by roasting the ore and exposing it to the air. The sulphur attracts oxygen, and is converted into sulphuric acid; and the metal at the same time being oxidized combines with the acid. After some time the sulphate is extracted by solution in water, the solution is evaporated to dryness, and the mass is run into moulds. The taste of this salt is extremely astringent. It reddens vegetable blues, though in con position it is strictly a neutral salt. Dilute nitric acid combines rapidly with zinc, and produces much heat at the same time that a large quantity of nitrous fumes is evolved. The solution is very caustic, and affords crystals by evaporation of nitrate of zinc, Zn(NO<sub>3</sub>)<sub>2</sub>. Hydrochloric acid acts very strongly upon zinc, and disengages much hydrogen. Phosphoric acid also dissolves zinc.

The *ores of zinc* are five in number, namely, *blende*, *red oxide of zinc*, *electric calamine*, *calamine*, and *white vitriol*.

1. *Blende*, which is a more or less pure zinc sulphide, occurs crystallized in rhombic dodecahedrons, octahedrons, and in numerous intermediate forms. Lustre adamantine; colour reddish-brown, black, yellow, and green; streak white to reddish-brown; hardness equal to that of apatite; specific gravity 4.5 to 4.8. It occurs massive also, as well as in crystals; structure curved, lamellar, columnar, granular, and impalpable. Blende occurs in primitive and secondary rocks, and is found associated with galena and copper pyrites. It is mined in Wales, Cumberland, the Isle of Man, &c., in various European countries, and in America. It is the ore which affords the greater part of the zinc of commerce.

2. *Red Oxide of Zinc*.—This interesting ore possesses only a lamellar structure, never having been met with in perfect crystals. It yields to cleavage parallel to all the faces of a regular six-sided prism. Its colour is ruby or blood-red. It is translucent, with a shining lustre. By long exposure to the weather it suffers decomposition at the surface. It is easily scratched by the knife; specific gravity 6.2. It is found only in New Jersey, where it occurs along with ores of iron and manganese.

3. *Electric Calamine*.—This ore occurs crystallized, stalactitic, mammillary, and compact. The crystalline forms are numerous; the primary form is that of a right rhombic prism of 102° 30' and 77° 30'. The crystals are not often solitary, but mostly disposed in radiating groups. It varies from transparent to translucent or opaque. Its hardness is above that of apatite; specific gravity 3.4. Its colours are grayish, bluish, and yellowish-white, or possessed of some tinge of green; and occasionally it presents a brownish or blackish colour. It is a hydrated silicate of zinc. When gently heated, it is strongly electric; some varieties become so by friction. Its native localities are in primitive and secondary rocks. It is found in various parts of Europe, including Scotland, England, and Wales.

4. *Calamine*.—This valuable ore, which consists mainly of zinc carbonate, is found crystallized, pseudomorphous, and massive. The crystals are obtuse or acute rhomboids, or long quadrilateral tables; cleavage is parallel to all the planes of an obtuse rhomboid of 106° 30'; lustre between vitreous and resinous. It is more or less transparent, commonly of a grayish or yellowish-white colour, with some shade of green or brown; hardness equal to apatite; specific gravity 4.1 to 4.4. Calamine is very abundant in Silesia and Belgium, which furnish most of the zinc of commerce.

5. *White vitriol* occurs massive, stalactitic, botryoidal, reniform, and investing. The structure of the massive is fibrous and radiated. It is shining, soft, brittle, and translucent; specific gravity 2. It has a nauseous and metallic taste. It occurs principally with blende, from whose decomposition it is supposed to arise. Its localities are England, the Hartz, Austria, and Sweden.

The ores of zinc are met with in Germany, Belgium, France, and Sweden; in Cornwall and the Mendip Hills; in Derbyshire; in Flint and other Welsh counties; at Aldstone Moor in Cumberland; and at Wanlock Head and Lead Hills on the borders of Dumfries and Lanark. But the zinc now produced in the United Kingdom is trifling in quantity, so that a large amount is imported, chiefly from Germany, Holland, and Belgium.

To obtain the metal, the ore, whether it be calamine or blende, after being raised from the mine is carefully picked, to separate any impurities, and

roasted in a furnace at a moderately red heat, by which the carbonic acid is driven off from the calamine and the sulphur from the blende. An oxide of zinc remains, which is intimately mixed with powdered coal, and the mixture is put into large earthen crucibles about 4 feet high, having an iron tube in the interior, one end of which rises nearly to the top, the other passing through the bottom of the jar and the floor of the furnace into a cistern of water underneath. Covers are firmly luted to the crucibles; they are surrounded with fuel in the furnace, and an intense heat is kept up for several hours. The carbon of the coal combines with the oxygen of the zinc oxide, and the reduced and molten metal drops into the water beneath. Zinc is made into various articles, is largely used for galvanizing iron and in sheets for roofing, &c., and is one of the components of brass and other alloys. Oxide of zinc is employed as a white pigment.

**ZINCOGRAPHY.** See **LITHOGRAPHY**.

**ZINGARELLI, NICCOLO**, composer, was born at Naples, in 1752. In the seventh year of his age he lost his father, and was placed at the conservatory in Loreto, for the purpose of studying music under Paganini. Cimarosa and Giordano were his school-fellows here. To obtain a more complete knowledge of the theory of the art, he also studied under the abbate Speranza, and on leaving the conservatory received the place of master of the chapel at Torre dell' Annunziata. In 1781 he composed for the theatre San Carlos, in Naples, his opera *Montezuma*, and in 1785 brought forward his *Alzinda* in the theatre Della Scala in Milan, with great success. In this work he adopted a more simple and easy style. His best operas are *Pirro*, *Artaserse*, and *Romeo e Giulietta*. In 1789 he brought out his *Antigone*, from Marmontel, in Paris; but the public events then occurring absorbed the attention of the public, and he soon returned to Italy, where in 1806 he became director of the Vatican chapel. In 1812 he was appointed chapel-master in St. Peter's, and soon after director of the new conservatory in Naples. Zingarelli composed much church music, and his works are highly esteemed for their expression. He died at Naples, 5th May, 1837.

**ZINGIS (GENGIS, or JENGHIS) KHAN.** See **GENGIS KHAN**.

**ZINZENDORF, NICHOLAS LUDWIG, COUNT VON**, founder of the Society of United Brethren, was born at Dresden, Saxony, 26th May, 1700. His father, who was a minister of the elector, died early, and he was educated by his grandmother, Mme. von Gersdorf. The visits of the Pietist Spener, and the daily religious meetings held in the house, excited in young Zinzendorf a zeal which found expression in acts of juvenile enthusiasm. He is said to have written letters to the Saviour and thrown them out of the window in the hope that he might find them. At the age of ten he was sent to the Academy of Halle, then under the founder Francke. Here he established religious meetings, and founded a mystic order of the Mustard-seed. In 1716 his uncle sent him to the orthodox University of Wittenberg, where the practices of the Pietists were discontinued. His sentiments, however, remained unchanged, and he determined to devote himself to the clerical profession. In 1719 he left the university and travelled in Holland and France. He has described his travels in a work entitled *Pilgrimage of Atticus* through the World. In 1721 he received an appointment from the Saxon government, which he held till 1727, but his mind was wholly taken up with religion and the study of theology, and in the latter year he gave up his situation. In 1722 he married a countess of Reuss von Ebersdorf, and in the same year he received

the emigrant Moravian Brethren as settlers on his estate at Berthelsdorf in Upper Lusatia. This settlement received in 1724 the name of Herrnhut. With a view to founding the body called the United Brethren (see **UNITED BRETHREN**), he published various projects, not in harmony with each other, which excited opposition, but he persevered in his plan and finally succeeded. In 1734, after passing a theological examination under an assumed name, he preached in a city church at Stralsund. After two years spent in travelling on behalf of his society, he was banished in 1736 from Saxony. The order of his banishment was repealed in 1747. In the meantime he had been consecrated bishop of the Moravian church in Berlin. In 1739 he wrote a catechism which he styled the Good Word of the Lord, and the same year visited the missions of the Brethren in the West Indies. In 1742 he visited their establishments on the continent of America, and assisted in establishing missions among the Indian tribes. He wrote during his various journeyings more than a hundred books, and numerous hymns which are to be found in the old hymn-book of the Herrnhuters, and which are said to be devoid of poetical taste, and somewhat indelicate in their imagery. In 1748 he returned to Europe and made a journey to Livonia, from whence the Russian government sent him back under a military escort to the frontier. He afterwards visited Holland, spent several years in England, and obtained an act of Parliament for the protection of his followers in the British dominions. His second wife was Anna Nitschmann, superintendent of the single sisters at Herrnhut. He died at Herrnhut, 9th May, 1760.

**ZION.** See **JERUSALEM**.

**ZIRCON**, a rare mineral containing silica and zirconia (the oxide of zirconium).

**ZIRCONIUM**, a rare metal found in zircon as a silicate, and closely related to titanium; symbol Zr, atomic weight 90.6. It has been prepared as an amorphous powder and also as crystalline scales, and it forms an oxide,  $ZrO_2$ , which is used in the mantle of the Welshbach incandescent gas-light.

**ZIRKNITZ**, a lake of Austria, Carniola, 80 miles E.N.E. of Trieste, in a deep valley surrounded by mountains, the principal of which are Javornik, Sucehi, Slivizza, and Sternitz. In the neighbourhood are numerous villages, among others, at an elevation of 3500 feet, Zirknitz, from which the lake takes its name. It is liberally fed by six streams, and being surrounded by mountains which have no external outlet it follows that there must be an internal drainage. The district called the Karst skirting the northern coast of the Adriatic, in which the lake is found, is a barren country. Its geological formation is of limestone. It fissures readily, and contains beneath the surface numerous caves and channels. Thus the rainfall is rapidly absorbed and gathered in these subterranean reservoirs while the ground above is parched. The bottom of the lake is of the same character. It contains numerous caverns, some of them of great depth, into which, when the season is dry, its water is absorbed, leaving it sometimes completely dry, with only a few pools, in which the fish take refuge. A luxuriant natural vegetation covers the surface of the deserted lake, and when the drought is protracted grass, millet, or buckwheat is sown on it and the harvest reaped before the return of the water. In June the lake is frequented by wild ducks, which afford abundant sport, and when the water is decreasing fish are caught in great numbers. The lake is from 6 to 7 miles long, nearly 3 broad, and of an average depth of 11 feet. It contains an average of about 115,000,000 cubic yards of water, but there is no stated limit to its basin. It

receives the drainage of a considerable country, and even when no rain falls in the immediate neighbourhood its reservoirs are filled from the rainfall of more distant hills. In dry seasons the lake takes about thirty days to empty. When rain has been abundant, and all its subterranean sources are in simultaneous activity, it reaches the average height in 72 hours, and when the rain has extended to all the tributary region it reaches its extreme level, which is about 2 feet above the average, in 196 hours. The natural outlets then no longer suffice to carry away the water, and it overflows the country, damaging or destroying the surrounding villages. The emptying and flooding of the lake depends upon the drought or moisture of the season, and is not strictly periodic. It has been known to empty and fill three times in one year. From 1707–14 it was only once dry, and from January, 1834, to February, 1835, it remained entirely without water, the longest drought on record. This lake was known to the ancients for the same phenomena, and it has been picturesquely described by Tasso in his *Sette Giornate del mondo*.

**ZITTAU**, a town of Saxony, in the circle of Bautzen, on the Mandau, near its junction with the Neisse, 49 miles S.E. of Dresden, with which it is connected by railway. It is a handsome well built town, and is situated in a beautiful locality. Fine promenades planted with trees and flowers surround the town, and market and other gardens are abundant in the suburbs. The chief public buildings are a splendid town-house, the churches of St. Peter and St. Paul, St. John, and Mary, the last a R.C. one, hospitals, custom-house, gymnasium, a municipal museum, and a valuable library. Its principal manufactures are cotton-spinning, dress goods, iron-founding, machinery, stained glass, cycles, ropes, paper, brewing, and brick-making; and there is a trade in cotton and linen goods, chemicals, &c. There are a number of lignite (brown-coal) mines in the neighbourhood. Pop. (1895), 28,132; (1900), 30,921.

**ZIZKA**, or **ZISKA**, **JOHANN**, the celebrated leader of the Hussites, was born about 1360 (according to other accounts 1380), at Trocznow, in the circle of Budweis, on an ancestral estate, and according to tradition under an oak in the open air. About the circumstances of Zizka's life not connected with his public career there are great discrepancies among authorities. He lost his right eye, whether as a boy or in battle accounts differ. At an early age he went on foreign service (English we are informed by one authority, Polish by another), but he appears first to have distinguished himself in the Polish war with the Teutonic knights, and especially in the great battle of Tannenberg, 15th July, 1410. He was also present in the English service at the battle of Agincourt in 1415. He had apparently been employed before his foreign career as a page in the court of King Winceslaus, and after his return he became chamberlain, and enjoyed to some extent the confidence of the monarch. Having adopted the religious views of the reformers he shared in the indignation which was felt by the Bohemians at the execution of Huss and Jerome, and he was also said to have had private wrongs to avenge, a story being told of a sister violated by a monk. King Winceslaus, whose character and policy were of the most wavering kind, is said to have given him permission to avenge the wrongs of his countrymen; but when the Bohemians took arms Winceslaus was alarmed for his own crown, and in vain endeavoured to pacify them. A casual insurrection broke out at Prague during a Hussite procession on 30th July, 1419. The mob, headed by Zizka, seized the town-hall and precipitated thirteen councillors from the window on the spears of their comrades below, by whom they were massacred. Winceslaus died a

few days after this insurrection, and was succeeded by his brother the Emperor Sigismund, the object of the inveterate hatred of the Hussites. The people crowded to the capital to take part in the insurrection, and Zizka would not listen to terms of accommodation. To avoid a siege he left Prague and established himself at Mount Tabor, which he fortified, and where a town grew up occupied by his followers, who thence subsequently took the name of Taborites to distinguish them from the more moderate Hussites known as Calixtines. Sigismund invaded Bohemia with a powerful army, and Pope Martin V. proclaimed a crusade against the Hussites, which, together with the cruelties of the imperialists, exasperated the national resistance, and the nobles began to join Zizka. After defeating the imperialists he seized Prague with a few thousand men on 20th May, 1420. On the approach of Sigismund he occupied Mount Witkow, afterwards called by his name, and defended it with 4000 men against 80,000, 14th July, 1420. In November he took the castle of Wyschehrad near Prague, in which he captured four cannon, the first that had come to Bohemia. The excesses of the more zealous Hussites divided the party, and the more moderate withdrew their assistance from Zizka, who, on the death of Nicholas de Hessebecz, 24th December, 1420, became the sole leader of the Taborites. He provided his men with fire-arms, and being deficient in cavalry, made use of baggage carts to fortify his infantry against the cavalry of the enemy. At the siege of Raby, 1st December, 1421, Zizka lost his other eye; but he continued to direct the operations of his army, availing himself of his knowledge of the country, and getting descriptions from his officers of the localities. On 18th January, 1422, he defeated a powerful army of imperialists at Deutschbrod, and in the same year he carried the war into Moravia and Austria, and defeated the Saxons at Aussig on the Elbe. He fought in all thirteen pitched battles, in only one of which, Kremsir, he was compelled to retreat, besides incessant minor engagements against the imperial partisans, the inhabitants of Prague, and the Bohemian nobles, in which he was almost uniformly successful; but his victories were stained with excesses, of which the only apology is that they were provoked by the cruelties of his enemies. In 1424 the emperor, despairing of subduing the Bohemians, entered into negotiations with Zizka, which had nearly proceeded to a successful issue, though hostilities still continued, when Zizka, who was engaged in the siege of the Castle of Przbislaw, in the district of Czaaslau, was carried off by the plague, 12th October, 1424. He was buried at Czaaslau.

**ZIATOUST**, **ZLATOUSK**, or **SLATOUST**, a town of Russia, government of Ufa, on the banks of the Ai, among the Ural Mountains. It ranks as the Birmingham and Sheffield of the Ural. Among its public buildings is a museum erected by the Emperor Alexander I., containing a fine collection of arms, cuirasses, and similar curiosities, with specimens of every variety of sword or other arm manufactured at the works, a library, and a well-arranged collection of minerals. The works themselves include blast-furnaces, forging-mills, and every requisite for converting iron into steel, and an enormous fire-proof building of three stories, where sabres, swords, daggers, and helmets are forged and finished. Pop. 20,000.

**ZNAIM**, a town of Austria, in Moravia, capital of a circle of same name, on a height above the left bank of the Thaya, 34 miles south-west of Brünn. It is well built; and has five churches, two convents, two chapels, a gymnasium, barracks, a theatre, and manufactures of earthenware, leather, and chocolate. Pop. (1880), 12,254; (1890), 14,515.

**ZOANTHARIA**, an order of the class Actinozoa (Ctenostomata), represented by the Sea-anemones (which see) and by the great bulk of coral-secreting polypes. (See **SCLERODERMIC** and **SCLEROBASIS CORAL**.) In this order the tentacles are not fringed, but are simple tubular organs. The soft parts of the body (tentacles and mesenteries) exist in multiples of five or six. When coral is developed it is usually sclerodermic in its nature.

**ZOANTHUS**, a genus of Zoantharia (which see) nearly allied to the Sea-anemones, and included in the special family Zoanthidae. These organisms are distinguished by their social nature—that is, each consists of several individuals united by a common basal stem or *cenosarc*. *Zoanthus Couchii* is a familiar species occurring on the British coasts, and especially on the Cornish sea-board.

**ZODIAC**, an imaginary belt in the heavens extending about 9 degrees on either side of the ecliptic divided into twelve signs, namely, Aries, Taurus, Gemini, Cancer, Leo, Virgo, Libra, Scorpio, Sagittarius, Capricornus, Aquarius, and Pisces. See **ECLIPTIC** and **SYMBOLS (ASTRONOMICAL)**.

**ZODIACAL LIGHT**, a phenomenon seen in this country in the evenings of the months of March, April, and May, and in the mornings of those of September, October, and November, after sunset and before sunrise respectively. At places near the equator it is visible at all seasons. Sir John Herschel thus describes its appearance:—‘At the vernal equinox the appearance of the zodiacal light is that of a pretty broad pyramidal, or rather lenticular, body of light, which begins to be visible as soon as the twilight decays. It is very bright at its lower or broader part near the horizon, and (if there be broken clouds about) often appears like the glow of a distant conflagration, or of the rising moon, only less red. At higher altitudes its light fades gradually, and is seldom traceable much beyond the Pleiades, which it usually, however, attains and involves; and its axis at the vernal equinox is always inclined (to the northward of the equator) at an angle of between 60° and 70° to the horizon; and it is most luminous at its base, resting on the horizon, where also it is broadest, occupying in fact an angular breadth of somewhere about 10° or 12° in ordinary clear weather.’ The zodiacal light is now believed to owe its existence to a vast number of meteorites revolving round the sun.

**ZOEÆ**, the name given to the youngest stage in the development of the Crabs. A *Zoea* or Crab-larva is a little, free-swimming creature, consisting of a head and jointed tail, large paired eyes, and a carapace or shell. The *Zoea* corresponds to a highly-organized Nauplius (which see).

**ZOILUS**, the name of a Thracian rhetorician, who is chiefly remembered for the asperity of his criticisms on the poems of Homer. An account of his career is given by Vitruvius, which is not self-consistent, and the time at which he lived is uncertain. He is said to have been a pupil of Polycrates, to have been eminent before the rise of Socrates, and to have continued to write until the reign of Alexander. Vitruvius represents him as seeking the patronage of Ptolemy Philadelphus. Heracleides says he was originally a Thracian slave. He is reported to have died a violent death. The violence of his attacks on Homer procured him the title of *Homeromastix*. He also attacked Plato and Isocrates. He is said to have found fault with Homer principally for introducing fabulous and incredible stories into his poems. He has acquired the reputation of having been a captious and unjust critic, but Dionysius of Halicarnassus places him in the highest rank among critics.

**ZOLLVEREIN** (customs-union). The feeble German Confederation formed in 1815 failed in many

respects to meet the desire for union among the German people, or even to satisfy their practical requirements. The trade of Germany in particular suffered much from the obstructions caused by the different customs-systems of so many petty states. In 1818 Prussia took the initiative of abolishing internal customs, but this policy excited much opposition among the other German states, and even on the part of the Bund itself, which was indeed to some extent justified by the coercive measures used by Prussia to enforce the adoption of its policy on the smaller German states within its bounds. Prussia offered to admit the other German states within its union, but many of them preferred to set up rival and antagonistic associations. Thus Bavaria and Württemberg formed a customs league in 1827, and Hohenzollern joined these states in 1828. In the same year was formed the Middle German union, including Saxony, Hanover, Hesse, Brunswick, Nassau, Oldenburg, Bremen, Frankfurt-on-the-Main, &c., and in 1834 another union (*Steuerverein*) between Hanover, Brunswick, Schaumburg-Lippe, and which was joined by Oldenburg in 1836. But these hostile unions were not sufficiently extensive to have any great vitality, and they were gradually disintegrated by the desertion of their individual members to join the Prussian union. Electoral Hesse joined in 1831; Bavaria, Württemberg, Saxony, and other states in 1833; Hesse-Homburg, Baden, and Nassau in 1835; Frankfurt in 1836; Luxemburg in 1842; Hanover, Oldenburg, &c., in 1851. During the treaty period of 1854–65 nearly all Germany, with the exception of Austria, the two Mecklenburgs, and the Hanse-towns, was included in the union. A difference of views between the various parties to the union began at this time to develop, which caused much tedious negotiation. In general the north of Germany was in favour of imposing import duties on foreign trade for purposes of revenue only, while the south favoured protective duties. As each member of the Zollverein had an equal voice in the direction of a common policy it was impossible to adjust these differences so as to satisfy the more powerful states, particularly Prussia. Austria also wished either to be included in the union or to break it up. Matters continued substantially in the same state after the renewal of the treaty from 1st January, 1866, to 31st December, 1867; but the war of 1866 put an end to this agreement, and new arrangements were entered into according to the political combinations then formed, Prussia obtaining a preponderating influence in the union of 1867, which included the North German Bund, Bavaria, Württemberg, Baden, Hesse (south of the Main), and Luxemburg. It was directed by a Zollbundesrath and a Zoll parliament. The total number of votes in the Zollbundesrath was 58, of which Prussia had 17. This arrangement, formed for twelve years, was also brought to an end prematurely by the formation of the German Empire. By article 38 of the constitution of the empire the territory included in the Zollverein is to coincide with the territories of the empire, with a few exceptions noticed below. The powers of the Zollbundesrath and Zoll parliament are transferred to the legislative bodies of the empire, and the affairs of the central bureau of the Zollverein are transferred to committees formed by the Federal Council of the empire. The territories of the free ports of Hamburg and Bremen were for some time excluded from the Zollverein, and some communes of the Grand-duchy of Baden and a fragment of Hamburg are still excluded from it; while Luxemburg and the Austrian commune of Jungholz are included in it.

**ZOMBOR**, or **SOMBOR**, a town of Hungary, capital of county of Bacs, on the Meczunka, near the Fran-

sans Canal, and not far from the Danube, 32 miles north-east of Eszek. It has a Roman Catholic and two Greek churches, handsome county-buildings, a townhouse, a large exchequer-office, barracks, and a considerable trade. Pop. (1900), 29,609.

**ZONARAS, JOANNES**, Byzantine historian, a monk of St. Basil, by birth a Greek, who lived during the latter part of the eleventh and the earlier part of the twelfth century. Before he renounced the world for the cloister he had filled some distinguished offices about the Imperial court, but becoming at length disgusted with its intrigues, gave himself up to a religious life, employing his leisure hours in the compilation of a History of the World from the Earliest Periods to the Year 1118. In this work (of which an edition appeared at Paris in two folio volumes, 1687) he follows principally the narrative of Dion Cassius; and all the earlier part of the book is a tissue of fable; but as he approaches his own times he becomes more entitled to attention, as his mistakes arise evidently more from ignorance than design. There is also extant a commentary on the apostolic canons by him.

**ZONE** (Greek, *zōnē*, a belt), the term applied to any portion of the earth's surface bounded by two parallels of latitude, but more particularly applied to five such zones, the position of which is marked by natural boundaries. These five zones are called the torrid, northern and southern temperate, and northern and southern frigid zones. The torrid zone extends 23½° north and south of the equator; and twice a year the sun shines vertically on its inhabitants. This zone is bounded, on both sides of the equator, by the two tropics; that is, the circles in which the sun reaches its greatest distance from the equator. As the rays of the sun here are nearly vertical a perpetual summer reigns, and day and night under the equator are always equal; and even at the tropics the difference is scarcely an hour. Owing to the nature and situation, however, of the countries in this zone the heat is not everywhere the same. The warmest portions are the sandy deserts of Africa; in the regions nearer the equator where vegetation prevails the heat is less excessive, in the islands of the South Seas a milder climate prevails, and the highest mountains of Peru and equatorial Africa are covered with perpetual snow. The two temperate zones extend from the tropics to the polar circles. They contain the most populous countries, and the climate is various. As the distance from the tropics increases the heat under similar conditions diminishes, the difference of the seasons becomes greater, the days and nights become more unequal until we arrive at a point where once a year the sun does not appear above the horizon during the twenty-four hours, and once a year does not set for the same time. The circles passing through these points, parallel to the equator and the tropics, form the limits of the temperate zones, and are called the *arctic* and *antarctic circles*. The distance from the tropics to the polar circles, or the breadth of the temperate zones, both in the northern and southern hemispheres, is 43°. All beyond the polar circles to the poles is called the *frigid zones*. The distance from the polar circles to the poles is 23½°. The characteristic of the frigid zones is, that day and night are more and more unequal the nearer you approach the poles; and for days, weeks, and even months the sun is either constantly above or constantly below the horizon. At the poles the year consists of one day and one night each six months long. Of the land surface of the globe, the area in the temperate zones occupies rather more than a half, or nearly ½; that of the torrid zone amounts to ⅓, and that of the frigid zones to ⅙.

**ZÖÖID**, an important term used in zoology to indicate the separate animals of any compound organism. The separate organisms, for example, contained in a colony of Hydrozoa or Zoophytes (which see), or the numerous forms which make up the organism of a Flustra or Sea-mat (which see), are each named Zöoids. The entire compound organism is named the *individual*, since in zoology an 'individual' animal is said to be the *total result of the development of a single egg*, whether that result be represented by a single animal or a compound one.

**ZOOLOGY**, that branch of biology, or the science of living things, which treats of animals. The scope of the science may be gathered from the following enumeration of its main branches:—I. Theoretical or Pure Zoology, including: (1) *Morphology*, which treats of the outer form and internal structure of animals; (2) *Zootomy*, or animal anatomy, or comparative anatomy, which may be regarded as a part of morphology; (3) *Histology*, dealing with animal tissues; (4) *Embryology*, or ontogeny, treating of the development of individual animals from their earliest discernible stage; (5) *Physiology*, whose subject-matter is the functions of the animal organs; (6) *Bionomics*, which investigates the conditions of life as a whole, habits, instincts, &c.; (7) *Zoochemistry*, *Zoophysics*, and *Zoodynamics*, the chemistry, physics, and dynamics of the animal body; (8) *Pathology*, treating of the diseases or abnormal formations (*teratology*) of animals; (9) *Zoography*, or descriptive zoology, describing animal species in a scientific manner and arranging them in an ordered classification (*systematic zoology*); (10) *Zoogeography*, dealing with the distribution of animals on the surface of the earth; (11) *Palæozoology*, or animal palæontology, treating of the animals of former geological epochs as preserved in whole or in part in the geological record; (12) *Phylogeny*, which seeks to investigate the evolution of the various groups or types of animals; (13) *Thremmatology*, treating of variation, breeding, heredity, &c. II. Practical or Applied Zoology, including: (1) *Economic Zoology*, treating of useful domestic animals, insect pests, &c.; (2) *Parasitic Zoology*, treating of animal parasites, especially those which prey on man and the common animals; (3) *Commercial Zoology*, which deals with the commercial products furnished by animals. In addition to these sections of general zoology, whose scope includes, at least potentially, all kinds of animals, there are the departments of special zoology, which treat of particular groups of animals, among them being ornithology (birds), herpetology (reptiles), ichthyology (fishes), and entomology (insects). For information on the above subjects see the articles on ANIMAL, ANIMAL CHEMISTRY, SUB-KINGDOMS OF ANIMALS, VERTEBRATA, INVERTEBRATA, PROTOZOA, SPONGE, COELENTERATA, ECHINODERMATA, WORMS, MOLLUSCA, ENTOMOLOGY, CRUSTACEA, ICHTHYOLOGY, REPTILES, AMPHIBIA, BATRACHIANS, ORNITHOLOGY, MAMMALIA, QUADRUMANA, APE, CHEIROPTERA, CARNIVORA, CETACEA, INSECTIVORA, ROENTIA, UNGULATA, EDENTATA, SIRENIA, MARSUPIALIA, MONOTREMATA, NATURAL SELECTION, SEX, SPECIES, HEREDITY, EVOLUTION, DISTRIBUTION OF ANIMALS (in SUPP.), RESPIRATION, REPRODUCTION, PARTHENOGENESIS, CELL, EMBRYOLOGY, PHYSIOLOGY, GEOLOGY, INSTINCT, MONSTER, &c.

*Early History*.—The history of zoology may be regarded as beginning with Aristotle (384–322 B.C.), whose works reveal a classification of animals into the two main groups of Enæma or blood-containing animals and Anæma or bloodless animals, the former including the four classes of viviparous enæma, equivalent to mammalia, birds, four-footed, egg-



laying anæma, equivalent to reptiles and amphibia, and fishes; and the latter including the four classes of soft-bodied anæma, equivalent to Cephalopoda, soft-shelled anæma, equivalent to Crustacea, insects, and shell-bearing anæma, equivalent to Gasteropoda, Lamellibranchiata, and Echini. Among Aristotle's successors in zoological investigation in ancient times were Herophilus (third cent. B.C.) and Erasistratus (third cent. B.C.), both physicians who contributed to the progress of anatomy; the elder Pliny (23-79 A.D.), who wrote a most uncritical work on natural history; and Galen (131-200 A.D.), who is chiefly important as an anatomist and physician. The mediæval period witnessed no further progress in zoology, and the *bestiaries* and books severally known by the title *Physiologus*, which contained accounts of biblical and fabulous animals with allegorical and moralizing additions, are of no scientific value. The revival of the study of Aristotle effected a change for the better, but modern zoology does not begin till the era of the Renaissance. Three names worthy of note in the later mediæval period are those of Thomas of Cantimpré, Albertus Magnus, and Vincent of Beauvais.

*Modern History to Linnæus.*—The discovery of new countries at the beginning of the modern period greatly increased the number of known animals, and it was accompanied by the growth of the scientific spirit. Extensive collections began to be formed, and in the seventeenth century academies and societies were founded for the promotion of scientific research. One of the oldest of these institutions was the *Academia Naturæ Curiosorum*, established at Schweinfurt in 1651, and it was soon followed by the Royal Society of London and the Academy of Sciences of Paris. In his work *De Differentiis Animalium* (1552) Edward Wotton (1492-1555) presented Aristotle's zoological teaching without its mediæval accretions, and extended his master's classification by adding the group of Zoophyta, in which he included holothurians, star-fishes, sea-anemones, sponges, &c. The work of the zoological revival was carried forward by, among others, Conrad Gesner (1516-65), whose *Historia Animalium* (1551-58) may be regarded as an epoch-making work; Ulisse Aldrovandi (1522-1605); John Johnstone (1603-75), the last of the encyclopædists, who published a complete survey of the animal kingdom in four treatises (1649-53); Pierre Belon (1517-64), who wrote on fishes (1551) and birds (1555); Hippolyto Salviani (1514-72), author of a work on fishes; Guillaume Rondelet (1507-56), whose monograph on fishes is the chief of its time; Andreas Vesalius (1514-64), an anatomist; Hieronymus Fabricius (1537-1619), a pioneer in comparative anatomy; Thomas Willis (1621-75), who is of importance in the history of anatomy; Marco Aurelio Severino (1580-1656), an anatomist; Marcello Malpighi (1628-94), one of the pioneers in the application of the microscope to zoological investigation; Anton van Leeuwenhoek (1632-1723), another early microscopist of renown; Jan Swammerdam (1637-85), whose microscopic researches on insects, molluscs, and other animals were of the utmost value; Robert Hooke (1635-1703), of importance in the history of the microscope; William Harvey (1578-1657), who demonstrated the circulation of the blood and contributed in other ways to anatomical and physiological progress; Edward Browne (1644-1708), who made many dissections of animals; and Edward Tyson (1650-78), the first Englishman who published elaborate monographs of particular animals. John Ray (1627-1705), great as a botanist, is even greater as a zoologist. He did more for the science of animal life than any other man between

Gesner and Linnæus, and he has been justly called the father of modern zoology. He made zoological classification more truly scientific by clearly fixing the meaning of the term 'species', and by using anatomical characters in the determination of the larger groups. With his name we may associate that of his friends Francis Willoughby (1635-72) and Martin Lister (1638-1712) and Lister's friend Edward Lhuyd (1660-1709). Among other zoologists of note in the interval between Ray and Linnæus are Alexander Monro (1697-1767), a good comparative anatomist; Johann Philipp Breyn (1680-1764); Maria Sibylla Merian (1647-1717), who wrote on insects; Johann Leonhard Frisch (1666-1743), author of a description of the insects of Germany; René Réaumur (1683-1757), a distinguished entomologist; Johann Heinrich Link (1674-1734); Jean Antoine Peyssonel (born 1694), who established the animal nature of polyps; Jacob Theodor Klein (1685-1759), who proposed a purely artificial classification of animals; and John Woodward (1665-1728), an early palæontologist.

*Linnæus to Cuvier.*—Karl von Linné (1707-78), usually called Linnæus, marked a new era in both botany and zoology. He introduced the binary nomenclature of species, and he gave the science a fixed terminology. In his *Systema Naturæ* (1736) he gave the first entirely modern classification of animals, using in his scheme the descending series of terms, class, order, genus, species, and variety, which has ever since been used in the same way for the purposes of classification. His classes are:—I. Mammalia, with the orders Primates, Bruta, Feræ, Glires, Pecora, Belluæ, and Cete; II. Aves, with the orders Accipitres, Picæ, Anseres, Grallæ, Gallinæ, and Passeres; III. Amphibia, with the orders Reptilia, Serpentes, and Nantes; IV. Pisces, with the orders Apodes, Jugulares, Thoracici, and Abdominales; V. Insecta, with the orders Coleoptera, Hemiptera, Lepidoptera, Neuroptera, Hymenoptera, Diptera, and Aptera; VI. Vermes, with the orders Intestina, Mollusca, Testacea, Lithophyta, and Zoophyta. The principal zoologists of the period from Linnæus to Cuvier are the following:—Johann Friedrich Gmelin (1748-1804), who edited the thirteenth edition of Linnæus's *Systema*; George Louis L. Buffon (1707-88), author of a famous natural history (1749-88); Charles Bonnet (1720-93), known chiefly as an entomologist; O. F. Müller (1730-84), author of a fauna of Denmark; Thomas Pennant (1726-98), who wrote on the British Zoology; Eberhard A. W. von Zimmermann (1743-1815), a pioneer in zoogeography; Peter Simon Pallas (1741-1811), who investigated and wrote on the fauna of Russia and Siberia; Mathurin J. Brisson (1723-1806), chiefly an ornithologist; Johann P. Eberhard (1727-79); August J. G. K. Batsch (1761-1802), who grouped Linné's first four classes to form a division of Bony Animals; Johann C. D. von Schreber (1739-1810); Johann C. Erxleben (1744-77); John Latham (1740-1837), an ornithologist; George Edwards (1694-1773), also an ornithologist; Bernard Lacépède (1756-1825), a student of reptiles, fishes, cetaceans, &c.; Johann G. Schneider (1750-1822), who wrote on the amphibia; Marcus E. Bloch (1723-99), an ichthyologist; Jean G. Brugnières (1750-98); Johann H. Chemnitz (1730-1800), a conchologist; Karl de Geer (1720-78), an entomologist; Johann C. Fabricius (1743-1808), a very eminent entomologist; Johann K. W. Illiger (1775-1813), an entomologist; P. Lyonnet (1707-89); Abraham Trembley (1700-84), who investigated fresh-water polyps; John Ellis (1710-76), who advanced our knowledge of corallines; Daniel C. Solander (1736-82), who assisted Ellis; Sir

Joseph Banks (1748-1820); Jacques F. Dicoquemare (1733-89), a writer on sea-anemones; Filippo Cuvolini (1756-1810), a student of marine polyps and fishes; Martin F. Ledermüller (1719-69), who introduced the term Infusoria; Albrecht von Haller (1708-77), an eminent anatomist and physiologist; John Hunter (1728-98), an eminent anatomist; Lazaro Spallanzani (1729-99), a physiologist; Marie F. X. Bichat (1771-1802), the founder of histology; Kaspar Friedrich Wolff (1733-94), whose dissertation entitled *Theoria Generationis* (1759) is the starting-point of modern embryology; Jean Baptiste Lamarck (1744-1829), who fixed the two groups of Vertebrata and Invertebrata, and whose *Philosophie Zoologique* (1809) is of the utmost importance in the history of the evolution theory; and the so-called nature-philosophers, including J. W. von Goethe (1749-1832), Lorenz Oken (1779-1851), and others, who also contributed materially to the development of evolutionary conceptions.

*Cuvier to Darwin.*—George Cuvier (1769-1832) is the only name of supreme importance in zoology between Linnaeus and Charles Darwin. He rejected the view, held by Lamarck, that a linear classification of the animal kingdom is possible, and in his great work, *Le Règne Animal* (1817), he grouped his classes in four *embranchements*, representing four fundamentally distinct types of structure. These branches, with their contained classes, are as follows:—Vertebrata, including Mammalia, Birds, Reptiles, Fishes; Mollusca, including Cephalopoda, Pteropoda, Gasteropoda, Acephala, Brachiopoda, Cirrhopoda; Articulata, including Annelides, Crustacea, Arachnides, Insects; and Radiata, including Echinoderms, Intestinal Worms, Acalephæ, Polypi, Infusoria. He raised comparative anatomy to the dignity of a true science, and he carried out researches of the utmost value in paleontology. In the restoration of extinct animals from remains of parts he used his law of the correlation of parts, according to which animals are so constituted that single organs or parts can serve as an index to all other parts and to the general structure. Of the numerous workers who advanced the study of zoology from Cuvier's time down to that of Charles Darwin we can only name the following:—Geoffroy Saint-Hilaire (1772-1844), who opposed Cuvier's view regarding types; Johann F. Blumenbach (1752-1840), a distinguished comparative anatomist and physiologist; Ignaz Döllinger (1770-1841), an eminent anatomist and physiologist; Friedrich Tiedemann (1781-1861), also distinguished in anatomy and physiology; Karl A. Rudolphi (1771-1832), who wrote on physiology and intestinal worms; Karl Ernst von Baer (1792-1876), a most distinguished embryologist; C. H. Pander (1794-1865), also an embryologist; Martin H. Rathke (1798-1860), another eminent embryologist; Theodor Schwann (1810-82), the founder of the cell-theory; Johannes Müller (1810-58), 'the greatest of all investigators of animal structure' in his century; Sir Richard Owen (1804-92), a great morphologist of the Cuvierian school, who introduced the conceptions of homology and analogy in regard to animal parts; Michael Sars (1806-69); Johannes J. S. Steenstrup (1813-97), who first emphasized the fact of alternate generation; Rudolf Leuckart (1822-98), who founded the sub-kingdom of Coelenterata and set forth the phenomena of polymorphism; Karl T. E. von Siebold (1804-85), who established the sub-kingdom Protozoa; Louis Agassiz (1807-73), a distinguished student of fossil fishes who held to Cuvierian traditions to his death; Christian G. Ehrenberg (1795-1876), who shed much fresh light on the Infusoria; Edward Forbes (1815-54), a distinguished investigator of the British

marine fauna; Alcide D. D'Orbigny (1802-57), a paleontologist; Félix Dujardin (1801-60), who did valuable work on Infusoria, intestinal worms, and Medusæ; Antoine R. E. Claparède (1832-71), who wrote on Infusoria and Rhizopoda in collaboration with F. J. Lachmann (1832-61); William B. Carpenter (1813-85), an eminent physiologist and almost universal naturalist; Robert E. Grant (1793-1874), a pioneer in the more exact study of sponges; Max J. S. Schultze (1825-74); James S. Bowerbank (1797-1877), who did splendid work on the sponges; Henri Milne-Edwards (1800-85), whose special work was done on crustaceans, corals, and mammals; Johann F. Eschscholtz (1793-1831), known by a treatise on the Acalephæ; Stefano della Chiaje (1794-1860), who described Sicilian invertebrates; Jean L. A. Quatrefages de Bréau (1810-92); Émile Blanchard (1820-1900), author of works on insects; Pierre A. Latreille (1762-1833), best known by his work on insects; William Kirby (1759-1850), an entomologist; Hermann Burmeister (1807-92), an entomologist and writer on the Brazilian fauna; Albany Hancock (1806-73), who studied the Mollusca, Tunicata, and Brachiopoda; Henri M. Ducrotay de Blainville (1778-1850); and John V. Thompson (1779-1847), who proved the crustacean character of Cirripedes and investigated the Polyzon, the feather-star, &c.

*Darwin and After.*—The theory of the fixity of species was challenged at various times by different zoologists, notably by Lamarck, but it was not till the publication of *The Origin of Species* (1859) by Charles Robert Darwin (1809-82) that the old view became generally abandoned and the evolution or development theory took its place. Darwin found in the struggle for life and natural selection of favourable variations a sufficient and actually operating cause of the production of new species. He afterwards introduced new factors, but these have not been so generally adopted as his main one. Darwin's work, *The Origin of Species*, must be regarded as an epoch-making contribution to the evolution theory, which has completely transformed the whole outlook of the zoologist and has brought new branches of the science into being, notably threnimatology. It makes the tree-like classification to which systematists have steadily advanced a truly genealogical tree, and it has contributed enormously to the progress of what may be called philosophical zoology. The natural-selection principle was independently discovered at practically the same time by Alfred R. Wallace (1823- ), the eminent naturalist-traveller. Herbert Spencer had also formulated an evolution theory, extending to the whole of nature and life. Thomas Henry Huxley (1825-95), master of an admirably lucid and attractive method of exposition, and Ernst Hæckel (1834- ), have done admirable work in embryology and other branches of zoology, and have contributed much to developing and popularizing the Darwinian views. August Weismann (1834- ) is best known by his valuable contributions to the doctrine of heredity. The number of other zoologists who have done good work during the Darwinian period and under the influence of the Darwinian conceptions is so great that no attempt will here be made to enumerate them. Of zoological gardens the largest and best is still that of London, which was established in 1828. The best of the numerous marine zoological stations is the pioneer one founded at Naples in 1872 and supported mainly by the German government. In recent classifications the old sub-kingdoms have been practically discarded in favour of a greater number of *phyla*. The Brachiopoda and the Tunicata are separated from the Mollusca, the latter

being associated with the Vertebrata in a phylum Chordata. The old group of Vermes has been resolved into several phyla. See recent treatises on zoology, such as Parker and Haswell's and Sedgwick's.

**ZOOPHYTE**, a name popularly applied to all animals that resemble plants in appearance, but restricted more specially in zoology to the group of Hydrozoa, represented by the Sertularia (which see) or 'Sea-firs,' by the Tubularia, the Corynida, and many other groups of compound animals, which grow by a process of continuous budding or gemmation, and appear in the likeness and guise of plants. A zoophyte consists usually of a large number of separate beings or *Zoids* (which see) united by a common connecting medium or *cenosarc* to form a colony. The colony consists of, firstly, ordinary *Zoids*, each possessing a mouth, tentacles, and body-cavity, and devoted to the nutrition of the organism. The second element in the colony consists of the reproductive *Zoids*, which appear as simple buds containing male or female elements, or as more highly developed structures, which assume the form and guise of Medusæ or Jelly-fishes, and which may detach themselves from the parent colony and swim freely about. Thereafter these free-swimming buds produce eggs, the embryos resulting from which by budding grow up into the compound colony or zoophyte. The name *trophosome* is given to denote all the nutritive *Zoids* of a zoophyte, and the term *gonosome* is applied to the reproductive elements.

**ZOOTOCA**, a genus of Lacertilia or Lizards, represented by the Viviparous or Scaly Lizard (*Z. vivipara*) of Britain, which belongs to the family Lacertidæ. The tongue is slender and protrusible from the mouth, whilst it is also bifid or cleft at its tip. The limbs are well developed, each possessing five toes. The tail is rounded, and the body covered with scales. This lizard is not uncommon on heaths and commons, particularly in the south of Britain. The colours vary, but the most common hues are an olive-brown above, with a dark-brown line along the back and along each side, the under parts being orange-coloured, with black spots in the male and olive-gray in the female. The average length is 6 inches. The specific name *vivipara* is derived from the fact that, like the vipers and some other reptiles and Amphibians, this lizard hatches its eggs within its body, and the young thus come into the world alive.

**ZORNDORF, BATTLE OF**, one of the bloodiest battles of the Seven Years' war, fought on Aug. 25, 1758, between the Prussians commanded by Frederick the Great and the Russians under General Fermor. See SEVEN YEARS' WAR.

**ZOROASTER** (properly *Zarathustra*, Persian *Zerdusht*), the founder of the Parsee religion. The life of Zoroaster is completely enveloped in legend, and except from the work he has accomplished little or nothing can be discovered regarding it. The derivation of the name is unknown, but it was probably an official one, as it was borne by his successors, and he is usually distinguished by his family name Spitama, Zarathustra Spitama. In later times, when his religion was fully established, he was almost worshipped as a divine being, considered as above the archangels and next to God, and then the actions attributed to him are supernatural, and his history legendary; but even in the later accounts of the Zend-Avesta there is a manifest reference to a human original, and we may see in their exaggeration the gratitude inspired by the active benevolence of a good man and great reformer. 'He first thought good thoughts, first spoke good words, first performed good actions. He was the first priest, first warrior, and first cultivator of the soil. He first caused the wheel to turn among gods and among men.' This particu-

larity may perhaps indicate that the date of Zoroaster was not so remote as it has sometimes been placed. His history was already legendary in the time of Aristotle, who placed him 6000 years before Plato; others have supposed him to be contemporary or identical with Moses. The latest date generally assigned to him is 550 B.C. Modern researches place his period not later than 1000 B.C., or perhaps several centuries earlier. He lived in the reign of Vitaga or Gushtasp, a king of the Bactrian dynasty of Kāvja, anterior to the time of the Median and Persian monarchies. This king was a zealous propagator of the religion of Zoroaster. Bactria was the scene of Zoroaster's labours, and from thence his religion spread over Media and Persia. He appears to have been one of the Soashyantos or fire-priests of the early Iranian religion. According to the theory approved by scholars, the nomad Aryans first settled to agricultural life in Bactria. These settlers, the ancestors of the Iranian races, became alienated from their brethren who continued the nomad life, and, suffering from their depredations, at length came to regard even their religion with abhorrence, and placed their gods among the devils of their own creed. The new religion of the Iranians recognized a plurality of good spirits called Ahuras, which were opposed to the Devas of the Brahmanical creed. It was while the national religion was in this transitional stage that Zoroaster appeared and moulded the discordant elements of the national faith into a new system, the fundamental principle of which was monotheism. His views are to be found in the earlier Gāthas. (See ZEND-AVESTA.) He called the supreme being, to whom he directed that worship should be exclusively paid, Ahurō Mazdaō, the Ahura who is the creator of the world. This name has been successively modified into Ahuramazda in the cuneiform inscriptions, and Ormuzd among the modern Parsees. Zoroaster is said to have called himself a reciter of manthras, a messenger of Ahuramazda, one who received sacred words from Ahuramazda through the flames. The descriptions he gives of the nature of God are full of the most exalted conceptions; he calls him the Creator of the earthly and spiritual life; he who taught the sun and stars their way. He is not only a Creator, but an intelligent and moral ruler. While the views of Zoroaster's teaching derived from the earlier gāthas thus represent him as inculcating a pure and elevating religion, a speculative philosophy is ascribed to him which not unnaturally led to misconceptions of his theology, and speedily corrupted the religion he established. He imagined two principles which exist in all things, and are respectively the causes of all good and evil. These he called the Vohu Mano, or good mind, and the Ahem Mano, or naught mind; they are twins, and though opposed are inseparable, being apparently the necessary opposites of each other. The one creates day and the other night; the former produces life, and the latter extinguishes it. These two minds exist in Ahuramazda as well as in all created things. Such is Zoroaster's account of the origin of good and evil in the universe. Subsequent interpreters of his religion soon developed these two principles into two distinct and powerful beings, Ormuzd and Ahriman, the good and evil spirits, and gave to each of them a court of attendant ministers or councillors, six in number, so that a hierarchy of good and evil spirits, seven of each kind, was again established as an object of worship. The first of the angels of Ahuramazda is Vohu Mano, the good mind of Zoroaster, who is represented as the son of Ahuramazda; after him comes Ardibisheht, who is represented as the blazing flame of fire. He is the preserver of life, and represents the omnipresence of Ahuramazda. Others

preside over wealth, devotion, vegetation, &c. Besides the seven spirits there is an archangel Sraosha, who is possessed of great powers, and was the medium of revelation to the prophet. He first sang the five Gâthas of Zarathustra Spitama. He is the judge of men after death, and is worshipped for his power and purity. The dualism of the Persian creed is first developed in the Vendidad, which Haug dates partly as early as 1000 B.C., partly as late as 500 B.C. A small party continued to protest against the Zendic interpretation in favour of the ancient doctrine of Zoroaster as taught in the earlier Gâthas. They are said to have fallen into an opposite error of making the words Zervana Akarana, which simply mean time without bounds, into an independent being anterior to Ahuramazda. Among the doctrines of the Zend-Avesta are the distinction of a natural and a spiritual life, and a belief in immortality. Heaven is called the House of Hymns, and Hell the House of Destruction. Between heaven and hell is the Bridge of the Gatherer or Judge over which the good pass with safety, while the wicked are precipitated from it into hell. The resurrection of the body, the coming of a Messiah, Sosiosh, son of Zarathustra, and a final judgment, are foretold. Sosiosh is to be the last of three great prophets who are to precede the end of the world. The detailed description of the last judgment is contained in the Bundehesh. (See ZEND-AVESTA.) How far these doctrines are to be ascribed, as some hold, to Zoroaster, is doubtful.

**ZORRILLA Y MORAL**, José, Spanish poet, born in Valladolid on Feb. 21, 1817. He studied law in Toledo, but as his own tastes strongly inclined him to literature he went to Madrid, where he attracted considerable attention in 1837 by a volume of poems. His first important volume appeared in 1839, and in 1840-41 he published his *Cantos del Trovador*, which contains much of his best work. This was followed by *Flores Perdidas* (1843) and the epic *Granada* (1852). In 1854 he went to Mexico, where the Emperor Maximilian made him his court poet, but on his fall Zorrilla returned to Spain, and in 1855 he was elected a member of the Spanish Academy. He was crowned in the Alhambra at Granada in 1859, and on Jan. 23, 1893, he died in Madrid. His works include: *Poema Religioso* (1869); *Leyenda del Cid* (1871); *Composiciones Varias* (1877); *Recuerdos del Tiempo Viejo* (three vols., 1880-83), his autobiography; *Ecos de las Montañas* (1894); and several plays, of which the most successful was *Don Juan Tenorio* (1844). He was a thoroughly national poet, greatest in the lyric, where his splendid imagination, his mastery of form, and his gift of melodious writing found their best expression.

**ZOSIMUS**, a Greek historian who lived in the fifth century after Christ and wrote a history of the empire in six books, which is frequently referred to by Gibbon. He begins with the change of constitution introduced by Augustus, and his 1st book brings him to the reign of Diocletian, A.D. 305; in the 2nd, 3rd, and 4th books the history of the fourth century is given with more detail; the 5th and 6th books are occupied with the period from 395 to 410. From internal evidence the work must have been partly written after 425. Zosimus was a pagan, and has severely criticised the Christian emperors, and made the change of religion largely responsible for the decline of the empire. The best editions are those of Bekker (1837) and Mendelssohn (1887).

**ZOUAVES**, the designation of certain light infantry corps in the French army, which were organized in Algeria, and originally intended to be composed exclusively of the Kabyle tribe. The term is

derived from *Zuawa*, the name of a Kabyle or Berber tribe; but the idea was gradually abandoned of restricting admission to natives of Algeria, and the corps are now composed almost entirely of French soldiers. The picturesque Arab dress has, however, been retained.

**ZRINYI**, or **ZRINI**, NIKLAS, Ban of Croatia, Dalmatia, and Slavonia, and general of the Emperor Ferdinand I., is famous for his defence of the town of Szigeth against the Sultan Soliman, who besieged it in 1566 with 100,000 men and 300 guns to avenge the death of a pasha killed by Zrinyi in a skirmish. Zrinyi defended the place for nearly five weeks, and Soliman himself died 4th September, 1566, four days before the siege was concluded. Zrinyi was killed in the final assault, or, according to other accounts, beheaded on one of his own cannon.

**ZSCHOKKE**, JOHANN HEINRICH DANIEL, a celebrated German author, was born at Magdeburg on 22nd March, 1771, and received his education at the convent school and the gymnasium in that town. He quitted his native place in 1788, and for some time wandered about the country as play-writer to a strolling company of actors; but afterwards went to study at the University of Frankfurt-on-the-Oder. In 1792 he commenced life there as a private teacher, and produced several pieces for the stage. He subsequently settled down in the canton of the Grisons and became director of an academy at Reichenau, where he wrote a history of the Grisons (1798). He then became head of the department of public instruction at Aarau, and was soon afterwards sent by the Helvetic executive directory to Unterwalden as government commissioner, for the purpose of restoring tranquillity. He acquitted himself so satisfactorily that his powers as commissioner were extended to the cantons of Uri, Schwyz, and Zug. In 1800 he was appointed commissioner for the organization of the Italian territories of Switzerland, and he was also employed successfully in other capacities. In 1804 he became a member of the board of mines and forests; the same year he began the issue of his highly popular *Schweizerbote* (Swiss Messenger), and in 1807 a sort of newspaper. Through the greater part of his life Zschokke appeared as one of the most distinguished and energetic public men in Switzerland, but he found time to cultivate his favourite literary pursuits, and it is chiefly by his numerous writings, historical and fictitious, that he is known to the world at large. Among his works may be mentioned: *Geschichte des bairischen Volks und seiner Fürsten* (History of the Bavarian Nation and its Princes); *Ueberlieferungen zur Geschichte unserer Zeit* (Contributions to the History of our Time); *Des Schweizerlandes Geschichte für das Schweizervolk* (History of Switzerland for the Swiss People), one of the best of his works; and *Bilder aus der Schweiz* (Pictures from Switzerland). As a writer of tales he possesses a European reputation, and among them we may refer more especially to *The Creole*, *Alamontade*, *Jonathan Frock*, *Clementine*, *Oswald oder die Goldmakers' Village*, and *Master Jordan*. The work, however, which has had the most extended circulation is his *Stunden der Andacht* (Hours of Devotion), which, though rationalistic, has yet, from the pious feeling pervading it, found admirers among all classes of readers. He died at Biberstein on 27th June, 1848.

**ZSCHOPAU**, a town of Saxony, in the circle of Zwickau, on a river of same name, at the foot of the Zschoppenberg, 6 miles south-east of Chemnitz; with a castle and two churches, manufactures of woollen and linen cloth, lace, calico, and hosiery; dye-works, bleachfields, worsted, cotton, and other mills. Pop. (1895), 6962.

**ZUCCARELLI**, or **ZUCCHERELLI**, **FRANCESCO**, Italian painter, born at Pitigliano, in Tuscany, in 1702, studied painting at Florence and Rome, and after gaining some success in decorative landscape worked for five years in London as a scene-painter. He again came to England in 1752 and became a fashionable painter, patronized by the royal family, especially the Prince of Wales, and the aristocracy. He was one of the original members of the Royal Academy, which was founded in 1768. In 1773 he returned to his native country, and in 1788 he died in Florence. A large number of his works are in Windsor Castle, and he is also represented in Glasgow, Edinburgh, Paris (Louvre), St. Petersburg (Hermitage), Milan (Brera), and other cities.

**ZUCCARO**, **ZUCHARO**, or **ZUCCHERO**, **FEDERIGO**, Italian painter, born in Tuscany about 1542, was the son of a painter, Ottaviano Zuccaro. He was employed by Gregory XIII. to paint the vault of the Cappella Paolina in the Vatican, but having quarrelled with some papal officials and painted a scurrilous picture he fled to France, and ultimately he reached England in 1574. He left England about four years later, having in the interval painted portraits of Queen Elizabeth, the Earl of Leicester, and other distinguished persons, and afterwards worked in Venice until he returned to Rome to complete his work in the Cappella Paolina. On the invitation of Philip II. he went to Madrid in 1586 to paint for the Escorial, and on his return to Rome he founded the Accademia S. Luca, of which he became the first president. He died at Ancona in 1609. Many portraits of English personages in the Elizabethan era are wrongly ascribed to him, but some genuine works from his brush are extant. His brother **TADDEO ZUCCARO** (1529-86) worked at Urbino, Pesaro, and the Vatican.

**ZUCCHI**, **ANTONIO PIETRO**, Italian painter, born at Venice in 1726, received his training in art under his father, an engraver, his uncle, a scene-painter, and two other masters. In 1754 he accompanied the English architect Robert Adam on his journeys in Italy and Dalmatia, and on Adam's invitation he went to England in 1766. He decorated the interiors of several of the mansions built or altered by Adam, such as Caen Wood (Hampstead), Luton House (Bedfordshire), Osterley House (near Brentford), and Sion House (Middlesex). In 1770 he was elected an associate of the recently-established Royal Academy. He married Angelica Kauffmann in 1781 and retired with her to Italy. He died in Rome on Dec. 25, 1795. His younger brother **GIUSEPPE ZUCHI** completed many of the etchings of Angelica Kauffmann.

**ZUG**, a central canton of Switzerland, bounded, north by Zürich, east and south by Schwyz, south-west by Lucerne, and west by Aargau; area, 92 square miles. The surface, mountainous in the south-east and south, where the Rossberg occupies the frontier, slopes more or less gradually north and west, till it becomes comparatively flat. The drainage goes wholly to the basin of the Aar, which receives it partly by the Sihl, but chiefly by the Reuss. The only lakes deserving the name are the Zug and Egeri. The climate, rigorous in the mountainous districts, is so mild on the lower south slopes, that the chestnut thrives upon them, and even the fig-tree matures its fruit. The soil is fertile, and the pastures on the highlands are excellent. Fruit is abundant; and the lower slopes, with a southern exposure, are generally appropriated to the vine. Wood consists chiefly of pine and beech. The making of condensed milk, cotton spinning and weaving, silk-weaving, and paper-making are the chief manufacturing industries. The inhabitants

are almost all Roman Catholics, and speak German. The government is strongly democratic. Pop. (1900), 25,045.

**ZUG**, a town of Switzerland, capital of the canton of the same name, on the north-east shore of Lake Zug, 12 miles north-east of Lucerne. It has splendid old mansions and powerful watch-towers; several churches, some of them of interest; a Capuchin monastery and a convent; a cantonal government building in Renaissance style; a fine town-house in late Gothic style, with a museum of antiquities; an arsenal; manufactures of cottons, enamel-ware, metal goods, tobacco, cigars, soap, &c. In 1435, 1594, and 1887 portions of the town sank into the lake. Pop. (1900), 6597.

**ZUG, LAKE OF**, or **ZUGERSEE**, a lake in Switzerland, chiefly in the canton of Zug, but partly also in Lucerne and Schwyz. It is 1340 feet above sea-level; 12 miles long north to south, and varies in breadth from 3 miles to 1 mile at the centre. The shores are low in all directions except the south and south-east. In the former direction the Righi, with Mount Pilatus towering behind it, and in the latter the Rusbberg or Rossberg, rise in abrupt and lofty precipices, presenting scenery of the grandest description. At the foot of the Rossberg the depth of the lake is not less than 1200 feet. Steamers ply upon it, and the fishing, principally of pike and carp, is very productive.

**ZUIDER-ZEE** (South Sea, as opposed to the North Sea or German Ocean), a gulf of the North Sea, on the coast of Holland, between the provinces of Friesland, Overijssel, Gelderland, Utrecht, and North Holland; about 80 miles long, 45 miles greatest breadth, but only 10 miles broad between Enkhuizen and Stavoren. The islands Texel, Vlieland, Terschelling, Ameland, &c., separate it from the North Sea, with which it communicates by various channels, the principal being Marsdiep, betwixt the Helder and Texel, and the Vlie Strom between Vlieland and Terschelling. It contains the islands of Wieringen, Marken, Urk, and Schokland, and numerous sandbanks, especially in its northern portion; has on its shores numerous towns, and receives the waters of the IJssel, Vecht, Eem, Kuinder, &c., but is generally shallow, and only navigable by vessels of small draught. Oysters and plaice are plentiful. According to a scheme recently proposed, a great part of it is to be reclaimed at the expense of the Dutch government, by inclosing tracts along the margin with dams and pumping out the water. This great undertaking when carried out will add a large area to the Kingdom of Holland. The Zuider-Zee is of modern origin, having been formed chiefly since the twelfth century by successive irruptions of the sea. In earlier times there were here only a lake and marshes.

**ZUINGLIUS**. See **ZWINGLI**.

**ZULULAND**, a country lying on the south-east coast of Africa, belonging to the colony of Natal, and extending westward to the Transvaal Colony, and northward to Tongaland. The area is about 10,450 square miles; the population in 1898 was 201,365. The principal rivers are the Tugela, on the Natal boundary, the Buffalo, which joins the Tugela on the left, about midway up the Natal frontier, and forms the remaining portion of the boundary between Natal and Zululand; and the Umvolosi, which flows into St. Lucia Bay. From the coast at St. Lucia a range of mountains called the Libombo range runs northwards nearly parallel to the coast, separating the country into two regions. The coast region is unhealthy. The inland region is comparatively healthy, fertile, and capable of cultivation. Rich gold reefs have been found, and excellent coal

exists. The coal is to be worked and a railway has been constructed to the Tugela. The country, which since 1897 has been attached to the Colony of Natal, is mainly inhabited by the Zulus, who have long been distinguished as the most warlike of the Caffre tribes. The country inhabited by the Zulus was formerly much more extensive. In the beginning of 1879 the Zulu king, Cetewayo or Ketchwayo, with a large army of fairly disciplined troops armed with rifles, came into collision with the British in South Africa. This was partly due to a long-standing dispute as to the claims of the Zulus to the Utrecht district in the south-eastern angle of the Transvaal, partly to other causes, which at last induced Sir Bartle Frere, the governor-general of the British provinces in South Africa, to send an ultimatum to Cetewayo. To this no reply was sent, and war ensued. On the 22nd of January a portion of a British column, which seems to have been divided by a ruse of the enemy, was attacked at a place called Isandula or Isandhlwana, about 10 miles from Rorke's Drift on the Buffalo, by 20,000 Zulus, and completely destroyed. As soon as possible after the news of the disaster reached England, strong reinforcements were sent out, and on the 4th of July following the Zulu army was totally defeated at Ulundi. On the 28th of August Cetewayo was captured. Meanwhile Sir Garnet Wolseley had arrived with supreme military and civil authority in this part of Africa, and the Zulu territory was parcelled out by him among several chieftains who were placed under the paramount supremacy of the British government, and were not to be allowed to keep up standing armies, or to import firearms and ammunition. British residents were appointed, one in North and one in South Zululand. In 1883 Cetewayo was restored to a portion of his dominions, but was opposed by some of the chiefs. After severe fighting he placed himself in the hands of the British at Ekowe or Eshowe, where he died in 1884. Subsequently the Boers of the Transvaal made themselves masters of a considerable portion of the territory and incorporated it with their own republic. In 1885 the British assumed a protectorate over the coast of the country, and in 1887 annexed all the rest. A strip between Tongaland (now a British protectorate) and Swaziland also belongs to Zululand.

ZÜRICH, a canton of Switzerland, bounded north by Schaffhausen and Grand-duchy of Baden, west by Aargau, south by Zug and Schwyz, and east by St. Gall and Thurgau; area, 665 square miles. Though not properly mountainous, it has on its south and south-east frontiers several lofty ridges, remarkable for their parallelism. Except the Lägern and adjoining heights, they have their longer axis from south-east to north-west, and form a succession of terraces lowering gradually toward the north. The culminating points are the summits of the Hornli and the Schauenberg, both in the east. The general slope is towards the left bank of the Rhine, which drains part of it directly, and part indirectly, by the Thur, Töss, Glatt, and Limmat. Of the lakes, about forty in all, the most important are those of Zürich, Greiffen, Pfaffikon, Türlor, and Katzen. The climate is on the whole very temperate, but mists are very prevalent, particularly on the lower grounds. In some parts the prevailing rock is the Jura limestone, but a more recent formation, consisting chiefly of marl and sandstone in almost horizontal strata, is still more largely developed. One remarkable feature is the immense number and magnitude of the granite boulders which cover the surface. The minerals are few and of little value. The soil, with the exception of a few favoured spots, is far from fertile, and hence, though the arable land

is comparatively large and carefully cultivated, the corn produced falls short of the consumption. In some districts a wine of tolerable quality is produced. Wood seldom forms forests, but occupies many scattered patches and hedgerows. Game is scarce; fish almost superabundant. In no canton have manufactures made more progress. The great staples are silk and cotton goods. The inhabitants are almost all Protestants, and education is very generally diffused. Zürich was admitted into the Swiss Confederation in 1351, and readmitted in 1450, after a ten years' alliance with Austria. The government, formerly somewhat aristocratic, became decidedly democratic in 1831. A new democratic constitution was adopted in 1869. Zürich holds the first place in the Swiss Confederation. Pop. (1900), 430,336.

ZÜRICH (ancient, *Turicum* or *Tigurium*), a city of Switzerland, capital of the above canton, beautifully situated at the north-east extremity of the lake of the same name. It is divided by the Limmat into two unequal parts, forming the upper and the lower town, which are connected with their suburbs and with each other by seven bridges, the chief being the Quay Bridge. The upper town is built wholly on an acclivity on the right bank of the river, the lower occupies the left bank. The streets in the oldest quarters are narrow, crooked, and dark, but considerable improvements have recently been made, especially by levelling the old ramparts and thus obtaining a large space for an excellent promenade. The buildings most deserving of notice are the cathedral or Grosse Münster, on a hill near the right bank of the Limmat, a heavy massive structure in the Byzantine style; the Fraumünster, on the left bank of the river; St. Peter's church, with a fine tower and clock; the townhouse; the town library, containing 100,000 volumes; the museum, with a collection of home and foreign periodicals, and a rich library; the university; the new Swiss polytechnic school; the arsenal; the music buildings; the railway-station; the theatre and the post-office. Two public promenades add to the attractions of the city, besides a botanical garden and many smaller parks and walks connected with a variety of institutions public and private. Manufactures of silk and cotton, including dyeing and calico-printing, are extensive; those of candles, soap, tobacco, paper, leather, and machinery are also considerable. Besides the university and the polytechnic school, there are schools of medicine and of arts, secondary and elementary schools of all kinds, deaf and dumb and blind asylums, orphan and several other hospitals. Learned and other societies of various descriptions abound. Zürich is of great antiquity, and early became a Roman station. In 1219 it was declared a free imperial city. The preaching of Zwingli in the cathedral made it the centre of the Swiss Reformation. Here, in 1443, the Swiss defeated the Austrians; and here also, in 1799, the Russians were defeated by the French. Pop. in 1880, 25,102; including suburbs, 75,956; in 1901, 152,942.

ZÜRICH, LAKE OF, or ZÜRICHSEER, one of the principal lakes of Switzerland, chiefly in the canton of Zürich, but partly also in Schwyz. It forms a long irregular curve, bending round from south-east to north-west, convex on the south, and concave on the north side; greatest length, about 27 miles; greatest breadth, not exceeding 3 miles; greatest depth, 600 feet. Its scenery is distinguished not so much for grandeur as for beauty. The mountains around, nowhere exceeding 1700 feet above the lake, commence in wooded heights, and descend to the water's edge in gentle slopes, covered with vineyards, orchards, gardens, cultivated fields, and verdant meadows, and studded over with country-seats and



smiling villages. A considerable traffic is carried on upon the lake by means of sailing vessels, and numbers of steamers. It is well supplied with fish. Its chief feeder is the Linth Canal, communicating with the Wallenstätter-sea. It discharges itself at the town of Zürich by the Limmat.

**ZURRAH, LAKE.** See SEISTAN.

**ZUTPHEN**, a formerly fortified town of Holland, in the province of Gelderland, 27 miles north-east of Arnhem, on the right bank of the river IJssel, where it is joined by the Berkel. The principal church is that of St. Walpurgis, built in the twelfth century. The town was at one time a member of the Hanseatic League, and had a considerable foreign trade, which has now ceased to exist. But it still has an active home trade, more especially in sending timber, both rough and prepared, down the IJssel. Zutphen is notable as being the scene of the death of Sir Philip Sidney, who was killed before its walls in 1586. Pop. (1900), 18,490.

**ZUYDERSEE.** See ZUIDERSEE.

**ZWEIBRÜCKEN** (Latin, *Bipontium*; French, *Deux-Ponts*, 'Two Bridges'), a town of Bavaria, in the Palatinate, pleasantly situated among woody heights, on the Schwarzbach, in the Westrich district, 34 miles west by north of Landau. It is well built, and has Protestant and Roman Catholic churches and a synagogue; gymnasium, real-school, and several other schools; courts and public offices occupying the former ducal palace; an orphanage and hospitals; manufactures of silk plush, machinery, chicory, tacks, chains, leather, &c., and a trade in corn and cattle. The edition of the classics known by the name of 'Bipont' was published here in 1779 and subsequent years. Pop. (1900), 13,716.

**ZWICKAU**, a town of Saxony, capital of a district or circle of the same name, on the left bank of the Mulde, 60 miles w.s.w. of Dresden, and on the Leipzig Railway. It has several interesting churches, among them two ancient Gothic ones recently restored, one of them dating from the twelfth century; a gymnasium with a library; an old castle converted into a penitentiary; manufactures of linen and cotton goods, dyes, and chemical products, numerous tanneries, dye-works, bleach-fields, oil, saw, and other mills, and a considerable transit and general trade. Pop. (1890), 44,202; (1900), 55,830.

**ZWINGLI**, or (as it is often Latinized) **ZUINGLIUS, ULRICH**, a celebrated Swiss reformer, was a contemporary of Luther, and was born at Wildhaus, in the canton of St. Gall, on January 1, 1484. Ulrich was the third of eight sons of the bailiff of that place. He studied at an early age in Basel and Bern, and continued his studies in Vienna, where he occupied himself with philosophy, and again in Basel, where he devoted his attention to theology, under the direction of Wytenbach. In 1506 Zwingli became parish priest at Glarus, and here employed his time, as Luther had done in the Augustine monastery at Erfurt, in the diligent reading of the Holy Scriptures. He copied the epistles of St. Paul in the original Greek, and even learned them by heart—an acquisition which afterwards proved of great service to him in his public discussions. He accompanied the forces of Glarus during the campaigns of 1512, 1513, and 1515, in Lombardy, in the cause of the pope against the French, in the capacity of chaplain, and was rewarded for this service by the grant of a pension from the pope. In 1516 he became preacher in the convent of Einsiedeln, then a celebrated place of pilgrimage. Here he showed a spirit far in advance of the age, raising his voice not only against the corruptions and abuses that had crept into the church, and infected the public morals, but even against the pilgrimages in

honour of Our Lady of Einsiedeln, and calling upon the Bishops of Sion and Constance to promote a reformation of religious doctrines, in conformity with the dictates of the divine Word. At this time, however, his conduct was so far from exciting suspicion, that in 1518 the Papal legate Pulci gave him the diploma of acolyte chaplain to the holy see. He was, not long after, invited to Zürich, and entered on his office of preacher in the cathedral, January 1, 1519, with a discourse in which he declared himself for the use of the Scriptures in their genuine form, without regard to the prescribed texts and lessons. At Zürich Zwingli delivered a series of sermons on the Holy Scriptures; and these discourses, with those against error, superstition and vice, laid the foundation for his future work of reformation. The occasion which called him forth was similar to that which had aroused Luther. In 1518 Bernardin Samson, a Franciscan monk of Milan, appeared in Switzerland with the intention of raising money by the sale of indulgences. Zwingli, who was then preaching at Einsiedeln, opposed him there, and afterwards in Zürich, with all the power of his eloquence, and brought the indulgences into so much odium that Samson was not even permitted to enter Zürich; and the Bishop of Constance, to whom the vile arts of the monk were offensive, supported Zwingli in this measure. From this time Zwingli gradually went further in his plans, with the approbation not only of the Zürichers, but of the great body of the Swiss in general. In Zürich his reforms were so far promoted by the government that in 1520 a decree was issued ordering that the Holy Scriptures should be taught without human additions. In 1522 the reformation was extended to external ceremonies. In this year Zwingli was forbidden to preach by the Bishop of Constance. In it also he wrote his first work against the fasts of the church and began the study of Hebrew. The offers of promotion which he received from Pope Adrian VI. had not power to make him waver. In 1523 the government of Zürich invited all theologians to a public conference in Zürich, to convict, if possible, Zwingli of an error in doctrine. About 600 persons, clergy and laymen, were present at this disputation. Zwingli exhibited his opinions in the form of sixty-seven propositions, which were to form the subject of discussion; but the objections of the celebrated John Faber, afterwards bishop of Vienna, appeared so unsatisfactory to the magistracy of Zürich, that they adhered still more zealously to the preachings of Zwingli. The second dispute, in which Zwingli urged his objections to images and the mass with such force that the former were soon after removed from the churches, and the latter abolished, was held in the same year, in the presence of 900 persons. In 1524 Zwingli married Anna Reinhard, a widow, and the next year published his Commentary on True and False Religion. The reformation in his native land was now fixed upon a firm base; and he continued the work with undiminished zeal, warmly supported by the public authority, which suppressed the mendicant orders, required all questions of marriage to be settled by the civil tribunals, and established a better administration of the church revenues. In general Zwingli agreed in his opinions with the German reformers: like them he assumed the Bible as the only rule of faith, rejected all human additions, attacked the ambition and rapacity of the clergy, as well as the superstitions they had countenanced, and aimed to restore the church to the simplicity of primitive times. His views differed on some points from those of Luther, particularly in regard to the real presence, and on some less important matters relative to the liturgy. In order to

remove this wall of partition from between the two parties which adopted the new doctrines, a meeting between the Saxon and Swiss reformers was held at Marburg (October 1-3, 1529), at the suggestion of Philip the landgrave of Hesse. The former were represented by Luther and Melancthon, the latter by Zwingli and Ecolampadius. Although a complete union was not effected, yet a convention was agreed upon, the thirteen first articles of which, containing the most important matters of religious faith, were recognized by both parties; and the fourteenth declared that, though they could not agree as to the real presence of Christ in the eucharist, they would behave reciprocally in the spirit of Christian charity. In 1531 an open war broke out between Zürich on the one side and the Catholic cantons of Lucerne, Schwyz, Uri, Unterwalden, and Zug on the other; and Zwingli was commanded to take the field, bearing the banner of the canton, which it had been usual for an ecclesiastic to support. A battle ensued at Cappel, on the 11th of October, and Zwingli called upon his countrymen 'to trust in God'. But the enemy were more than twice as strong as the Zürichers, and under better officers: the latter were therefore defeated, and Zwingli was among the slain. The Reformed Church afterwards received from the hands of Calvin its present organization. The collected works of Zwingli were published at Zürich in 1545. A complete collection of Zwingli's writings was also published at Zürich in eight vols. 1828. E. Zeller has

attempted to deduce Zwingli's doctrines from his writings, *Das theologische System Zwingli's dargestellt* (Tübingen, 1853). There are numerous biographies of this reformer, for example, *Huldreich Zwingli, Sein Leben und Wirken* (1896-97) by Stähelin.

ZWOLLE, a town of Holland, capital of the province of Overijssel, 51 miles E.N.E. of Amsterdam, on the Zwarte-Water, a stream that enters the Zuiderzee, and communicating by a canal with the IJssel, 3 miles distant. It was formerly a fortified, but is now an open town, the last remains of its walls having been levelled in 1842, and the whole converted into pleasant walks. The town is intersected by three canals, across which are numerous bridges of wood and stone. It has several open spaces called market-places, of which the Groote Market, in the centre of the town, is not only the finest, but one of the most beautiful in Holland, surrounded as it is with elegant houses. The chief buildings are the church of St. Michael (Reformed), a large and fine building with a celebrated organ and memorial tomb of Thomas à Kempis, the government building, the court-house, the modernized town-house, the prison, theatre, hospitals, schools, &c. There are iron-foundries, cotton-mills, and dye-works, corn-mills, important fairs, and a considerable shipping trade is carried on. Pop. (1900), 30,848.

ZYGÆNA, or HAMMER-HEADED SHARK. See SHARK.

ZYMOTIC DISEASES. See NOBILITY.

## SUPPLEMENT.

**TACHEOMETRY**, that is, 'rapid measuring', a term applied in surveying to a method which does away with the practice of measuring distances by the chain or tape-line, and ascertaining difference of level by a separate instrument, the relative position, both horizontal and vertical, of points on the earth's surface being determined by one observation. A theodolite, or a specially-constructed tacheometer, of which a telescope is an important part, is employed, and along with it a staff similar to a levelling-staff, 12 feet or so in length, and suitably marked or graduated. By the simplest method a theodolite is employed, and the horizontal and vertical distances are obtained from the angles of elevation or depression of two clearly-marked lines at known heights on the staff, which must be held quite vertical and observed by the telescope. In some instruments the horizontal distance is obtained from the readings of a suitably-graduated staff, indicated by two fixed wires (*stadia wires*) in the diaphragm of the telescope, the diaphragm being movable, and the principle of similar triangles being utilized.

**TAJURRAH**, a bay and seaport of Africa, included in the French Somali Coast protectorate or territory of Obok, on the Gulf of Aden. The rising French seaport of Djibouti or Jibutl is at the entrance of the bay, on the south side, whence a railway is being built to Harrar. See **ARYSSINIA**.

**TAKAMATSU**, a town on the north coast of the island of Shikoku, Japan, on the southern shore of the Inland Sea. Pop. (1899), 34,416.

**TALCA**, a town of Chili, capital of the province of the same name, on the Rio Claro, about 150 miles south of Valparaiso, on the railway from Curico to Concepcion. It is a fine city, with good churches and a lyceum. Weaving is the chief manufacturing industry. Pop. (1900), 40,987.

**TALCAHUANO**, a seaport of Chili, in the province of Concepcion, on Talcahuano Bay, 8 miles north of the town of Concepcion, with which it is connected by rail. It has a safe harbour, a large arsenal and docks, and a custom-house, and it exports much wheat. Pop. (1900), 15,376.

**TALIENWAN**, a bay of China, on the east side of the Liaotung peninsula, near Port Arthur. It is included in the territory leased to Russia for twenty-five years in 1898. A portion of the harbour is reserved for naval purposes, but another part, with the new town of Dalny, was opened to foreign trade in 1901. See **PORT ARTHUR** (in *SUPP.*).

**TALIESIN**, or **TALIESSIN**. See **WALES** (*Literature*).

**TALTAL**, a seaport of Chili, in the province of Antofagasta, about 200 miles south of Cobiya, the coast terminus of a line of railway. It exports a considerable quantity of mining products from the interior of the province. Pop. 5000.

**TAMATAVE**, the chief port on the eastern side of Madagascar, in 18° 10' south latitude. It has a

good anchorage, and is the port of the capital Antananarivo. Pop. about 10,000.

**TAMISE** (Flemish, *Temsche*), a town of Belgium, in the province of East Flanders, on the Scheldt, with flax-spinning, glove-making, ship-building, and other industries. Pop. (1890), 11,039.

**TAMMERFORS** (Finnish, *Tampere*), a town of Finland, in the government of Tavastehus, about 80 miles north-east of Åbo, on the railway from the Gulf of Finland to the Gulf of Bothnia. Its industries include cotton and linen spinning and weaving, and the manufacture of paper and iron. It is the principal manufacturing centre of Finland. Pop. (1899), 34,148.

**TAMPA**, a city and seaport of the United States, capital of Hillsborough county, Florida, at the place where the Hillsborough River joins Hillsborough Bay, an inner branch of Tampa Bay, about 175 miles s.s.w. of Jacksonville. It is surrounded by lemon and orange groves, and is a favourite health resort, but it is mainly of importance for its excellent harbour and its extensive trade. It has a flourishing cigar industry and other manufactures. Near it is Port Tampa, the starting-point of steamers for Key West, Havana, Mobile, &c. Pop. in 1900, 15,839.

**TAMWORTH**, a town of Australia, in New South Wales, on the Peel and Cockburn rivers and Goonoo-Goonoo Creek, 282 miles north of Sydney. It is situated in a pastoral, agricultural, and gold-mining district, and has two Anglican churches, a Roman Catholic cathedral, and other places of worship; a municipal building, with a free library; a court-house; police barracks; a jail; a mechanics' institute; two fine public schools and a Roman Catholic school; a Dominican convent; a government savings-bank building; a post-office; &c. Tamworth was the first town in Australia to adopt electric lighting for the streets. It has various manufactures. Pop. in 1901, 5802.

**TANFIELD**, an urban district of England, in Durham, 6 miles south-west of Gateshead, with an old church (restored), some chapels, collieries, stone-quarries, brickworks, &c. Pop. (1891), 6819; (1901), 8178.

**TANTA**, a town of Egypt, capital of the province of Gharbiyeh, in the Delta, about 50 miles north by west of Cairo, with large public buildings, a palace of the Khedive, bazaars, the modern and much-frequented mosque of the popular saint Seiyid Ahmed el-Bedawi, and three very important annual fairs. Pop. (1897), 57,289.

**TAOISM**, or **TAUOISM**, a religious system formed in China by Lao-tze. See **LAO-TZE**.

**TAORMINA** (Latin, *Tauromenium*), a town on the east coast of Sicily, 30 miles south-west of Messina. It is finely situated, and has a cathedral and Gothic palaces, but it is chiefly interesting for its ancient theatre (excavated in 1882), a Roman restoration of a Greek work, and other remains of

classical antiquity. It was founded by the Siculi about B.C. 400. Pop. 3000.

**TARAPACÁ**, a province of northern Chili, with rich deposits of nitre and other minerals. The capital and chief port is Iquique, and other ports are Pisagua and Patillos. It was ceded by Peru in 1883, after the conclusion of the war between Chili and Peru. Area, 19,300 square miles; pop. (1900), 98,769.

**TARGET**, (1) a shield or buckler of a small kind, such as those formerly in use among the Highlanders, which were circular in form, cut out of ox-hide, mounted on strong wood, strengthened by bosses, spikes, &c., and often covered externally with a considerable amount of ornamental work. (2) The mark set up to be aimed at in archery, musketry, or artillery practice and the like. In archery the target is about 4 feet across, and has a gold spot in the centre, surrounded by concentric rings of red, blue, black, and white, the outer border being green. A hit on the white counts one; on the black, three; on the blue, five; on the red, seven; and on the centre spot, nine. The targets used in rifle practice in Britain are generally square or oblong metal plates, the size depending on the distance for which they are used, and are divided into sections, called *bull's-eye*, *inner*, *magpie*, and *outer*, counting from the centre of the target to its edges. It is the marksman's aim to put his shots as near the central point as possible. If he hits the bull's-eye there are counted in his favour 5 points, the inner 4 points, the magpie 3 points, and the outer 2 points. These targets are usually all white, except the bull's-eye, which is black. For artillery practice various kinds of floating targets are in use.

**TARIJA**, a town of Bolivia, capital of Tarija department, 176 miles south-east of Potosi. It was founded towards the close of the sixteenth century. Pop. 12,000.

**TARNOWITZ**, a town of Prussia, in the province of Silesia, about 5 miles from the Russian frontier, with important iron-mines. The manufactures comprise iron, soap, lime, &c., and there is a trade in timber and other commodities. Pop. (1895), 11,281.

**TARPAN**. See **HORSE**.

**TARPON**, the *Megalops atlanticus*, a herring-shaped fish of the family Elopidae, found on the southern coasts of the United States and in the West Indies, and also known as *grande écaille*, *jew-fish*, and *sabalo*. It reaches a length of 5 or 6 feet, and from a hundred to several hundred pounds weight, and is of giant strength. Though too coarse ordinarily for food, it is a great attraction to anglers. Its scales, which are of great size, are largely used in ornamental work.

**TARRAGON** (*Artemisia Dracunculus*), a strong erect perennial plant of the composite order, a native of Siberia, cultivated in gardens for flavouring dishes. Unlike most plants of the genus, which includes wormwood, southernwood, &c., the tarragon has simple leaves.

**TARRASA**, a town of Spain, in the province of Barcelona, 15 miles north-west of the town of that name, with manufactures of cottons and woollens. Pop. (1897), 15,423.

**TARSUS**. See **FOOT**.

**TARTAN**, a well-known species of cloth, checkered or cross-banded with threads of various colours, especially worn in the dress of the Scottish Highlanders, each clan having its own peculiar pattern. An endless variety of fancy tartans are now manufactured, some of wool, others of silk or of mixed material. The term is also applied to the checkered patterns themselves.

**TARUDANT**, a town of Morocco, at the southern

foot of the Atlas, about 80 miles east from the Atlantic, and a short distance to the north of the river Sus. Agadir, at the mouth of the Sus, serves as its port. Pop. 9000.

**TASSISUDON**, the summer capital of Bhutan state, situated on the Godada river, about 130 miles north-west of Goalpara, and about 20 to the south-west of the winter capital, Punakha. There is a palace where the Deb Raja resides.

**TATAR-BAZARJIK**, a town in Eastern Roumelia, on the Maritza, 32 miles to the west of Philippopolis. It is a rapidly-developing town, with an important annual fair. Pop. (1893), 16,343.

**TATOUAY**. See **ARMADILLO**.

**TAUCHNITZ**, **CHRISTIAN BERNHARD**, **FREIHERR** von, German publisher, was born at Schleinitz, near Naumburg, on Aug. 25, 1816. In 1837 he founded his well-known publishing establishment in Leipzig; in 1860 he was created a hereditary noble, in 1866 he was appointed consul-general for Great Britain in the kingdom of Saxony, and in 1877 he was made a life member of the Saxon first chamber. He died on August 13, 1895, leaving his business to his son Christian Karl Bernhard, who had assisted him in it since 1866. The firm is best known for its editions of British authors, begun in 1841, and now extending to about 3500 volumes.

**TAUNUS**, a mountain range of Western Germany, mainly in the Prussian province of Hessen-Nassau, extending eastward from the Rhine, north of the Main, separating the basin of that river from that of the Lahn. The highest summit, Great Feldberg, is 2886 feet in elevation. This district is well wooded, and exhibits much picturesque scenery, as well as ruined castles, &c., and antiquarian remains dating from Roman times. Its scenery and mineral waters attract many visitors; and some of the finest German wines are grown on the south side.

**TAVIRA**, a seaport of Portugal, in the province of Algarve, on the Rio Asseca, about 85 miles north-west of Cadiz. The river is crossed by a bridge with a Moorish tower. The town is situated a short distance from the coast, in a well-cultivated hilly district. Its harbour is protected by a long sandy island. The trade is principally in sardines and tunnies. Pop. in 1900, 12,178.

**TAWING**. See **TANNING**.

**TAYLOR**, **BATARD**, American writer and traveller, was born at Kennett Square, Pennsylvania, on January 11, 1825. He was educated at West Chester and Unionville, and in 1842 was apprenticed to a printer in the former town, but he did not serve out his apprenticeship. In 1844 he set sail for Liverpool, and during the next two years he travelled, chiefly on foot, in Britain, Belgium, Germany, Austria, Italy, and France. He described his journeys for several American newspapers, his letters being collected and published on his return under the title *Views Afoot, or Europe seen with Knapsack and Staff* (1846). In 1847 he received an appointment on the staff of the New York Tribune, and two years later he went to California as special correspondent of that newspaper at the gold-fields, his letters being republished in 1850 under the title *Eldorado, or Adventures in the Path of Empire*. In 1851 he was again in Europe, and before returning to the United States in 1854 he visited Egypt, Asia Minor, India, Hong-Kong, China, and Japan. Among the literary results of this journey were: *A Journey to Central Africa* (1854), *The Land of the Saracen* (1854), and *A Visit to India, China, and Japan* (1855). He had by this time gained some reputation as a poet by *Ximena* and other Poems (1844), *Rhymes of Travel, Ballads, and Poems* (1848), *A Book of Romances*,

Lyrics, and Songs (1851), and Poems of the Orient (1854); and in 1855 he published a collective edition of these under the title Poems of Home and Travel. Northern Travel (1858) contains an account of a visit to Norway and Lapland. In 1862-63 he was secretary to the United States legation at St. Petersburg, and in 1870 he lectured at the Cornell University on German literature. He became United States ambassador at Berlin in May, 1878, and he died in the German capital on December 19th of that year. In addition to works already mentioned the following may be enumerated:—At Home and Abroad (1859-62); By-ways of Europe (1869); a translation of Goethe's Faust in the original metres (1870); several novels; and also some volumes of verse. Two collections of miscellaneous writings appeared posthumously, entitled respectively Studies in German Literature (1879) and Essays and Notes (1880). See the Life and Letters by his wife and H. E. Scudder (two vols., 1884).

TAYLOR, SIR HENRY, English poet and essayist, was born at Bishop-Middleham, Durham, on 18th October, 1800. He was educated at home by his father, a gentleman farmer, and at the age of fourteen he entered the navy, but was soon afterwards appointed to a clerkship in the storekeeper-general's office. He lost this position in his twentieth year, and retired to Witton Hall, his father's residence. Two years afterwards he was accepted as a contributor to the Quarterly Review by Gifford, and in 1823 he was appointed editor of the London Magazine. Soon afterwards, however, he relinquished this position and accepted a lucrative clerkship in the colonial office, where he remained for the next forty-eight years. Meanwhile he continued to contribute to the Quarterly Review. Isaac Comnenus, his first tragedy, appeared anonymously in 1827, and was favourably reviewed by Southey in the Quarterly; it was Southey also who suggested the subject of Philip Van Artevelde, his next and greatest piece of dramatic writing, begun in 1828 and completed in 1834. The volumes which followed were: The Statesman (1836), a prose volume containing commentaries on official life and the conduct of business; Edwin the Fair (1842), a historical drama; The Eve of the Conquest and other poems (1847); Notes from Life (1847); The Virgin Widow, a comedy, afterwards called A Sicilian Summer (1850); and St. Clement's Eve, a romantic drama (1862). In 1869 he became K.C.M.G., and three years later he retired from his office. He published a delightful autobiography in 1885, and died on 27th March, 1886. In 1877-78 a collective edition of his works appeared in five volumes.

TAYLOR, ISAAC, writer, son of the author of The Natural History of Enthusiasm, was born at Stanford Rivers, in Essex, on May 2, 1829. He graduated at Trinity College, Cambridge, as a wrangler in 1853, and in the following year he issued a translation of Bekker's Charicles. He was ordained in 1857, and in 1860 published The Liturgy and the Dissenters, a plea for the revision of the Book of Common Prayer. In the latter year he became a curate in London, and in 1864 he published the first of the works by which he is chiefly remembered, Words and Places, or Etymological Illustrations of History, Ethnology, and Geography. In 1865-69 he held a curacy in a Bethnal Green parish, and his arduous labours there are described in The Burden of the Poor. He became vicar of Holy Trinity, Twickenham, in 1869, and in 1875 he was presented to the rectory of Settrington, near Malton, in Yorkshire, which he retained till his death. In 1879 he first propounded the theory of the Greek origin of runes in a work entitled Greeks

and Goths: A Study on the Runes; and he published in German a treatise Über den Ursprung des glagolitischen Alphabets. These works secured for him the honorary degree of LL.D. from Edinburgh; but his *magnum opus*, The Alphabet: an Account of the Origin and Development of Letters, did not appear till 1883 (new ed. 1899). In 1885 he received the degree of Doctor of Letters from Cambridge, and was appointed to a canonry in York Minster. He died on Oct. 18, 1901. Canon Taylor's other works include—The Family Pen: Memorials, Biographical and Literary, of the Taylors of Ongar (1867); Etruscan Researches (1874); Leaves from an Egyptian Note-Book (1888), notable for a defence of Mohammedan beliefs and practices; The Origin of the Aryans (1889); and Names and their Histories: A Handbook of Historical Geography and Topographical Nomenclature (1896).

TAYLOR, PHILIP MEADOWS, Indian officer and novelist, was born at Liverpool on Sept. 25, 1808, and died at Mentone on May 13, 1876. From being a merchant's clerk in Bombay he entered the Nizam's army in 1824. He abandoned the army for civil employment for a time, but soon returned to it. In 1841 he received an appointment as administrator of the state of Shorapore, whose rebellious ruler he subdued by great tact and boldness. He maintained order in the Berar district during the mutiny in 1857, though he had no troops; and received the rank of colonel, a companionship of the Star of India, and a commissionership of the Western Deccan districts. He published Confessions of a Thug (1839); Tippoo Sultaun (1840); Tara (1863); Ralph Durnell (1865); Manual of the History of India (1870); and A Noble Queen (1878). In 1877 his autobiography in two volumes was published under the title The Story of My Life. His novels are excellent pictures of Indian life at important historical epochs.

TAYLOR, TOM, dramatist and journalist, born at Bishop-Wearmouth (Sunderland) on Oct. 19, 1817, was educated in his native city, at the University of Glasgow, and at Trinity College, Cambridge, graduating from the latter in 1840 with honours in classics and mathematics. He was elected a fellow of his college in 1842, and in 1845-47 he was professor of the English language and literature in University College, London. Called to the bar in 1846, he was on the northern circuit for a time, but in 1850 he was appointed assistant-secretary, in 1854 secretary, to the Board of Health. On the formation of the Local Government Board he was made secretary of the sanitary department, and when his post was abolished in 1871 he retired with a pension. He engaged in journalistic work at an early stage in his career, and in 1874 he succeeded Shirley Brooks as editor of Punch, holding this post till his death, which occurred at Wandsworth on July 12, 1880. He was the author of a large number of successful plays, including To Parents and Guardians (1845); Masks and Faces (1852), in collaboration with Charles Reade; To Oblige Benson (1854), an adaptation from the French; Our American Cousin (1858); New Men and Old Acres (1859), partly by A. W. Dubourg; The Overland Route (1860); The Ticket-of-Leave Man (1863), based upon a French work; The Fool's Revenge (1869), based upon Hugo's Le Roi S'Amuse; 'Twixt Axe and Crown (1870), adapted from the German; Joan of Arc (1871); Lady Clancarty (1874); and Settling Day (1877).

TECHNICAL EDUCATION in the widest sense may be said to cover everything in the nature of instruction of the individual whereby he is enabled the better to fulfil his function in life. But the

term is properly restricted to instruction which has a bearing on industrial and commercial life. It differs from education in the older classical or literary sense in being concerned more with *doing* than with *knowing*. Its sphere is among the 'realities' not the 'humanities', yet it must not be confounded with a purely scientific or art training. The studies are not prosecuted for their own sake, but in the interest of the intended occupation or pursuit of the pupil. Again, the word 'technical' is often used in the sense of 'professional'. But as regards the professional significance of many branches of technical instruction, these can always be readily differentiated from other kinds of purely professional instruction, e.g. that in a divinity hall, a law class-room, a clinical ward in a hospital, a normal or seminary, a school of dentistry, an art studio, or a conservatoire of music, by the consideration that in all these cases the instruction has nothing to do with construction, manufacture, or distribution. We have thus a clear line of demarcation between departments of instruction such as the foregoing, and those in architecture, engineering—civil, mechanical, electrical, mining, and sanitary—chemical technology, textile fabrication, industrial art, commerce, and so forth.

Technical education is often referred to as if it had been a discovery of the nineteenth century. This is largely true, but not altogether. The old apprenticeship system was the technical education of its day, and an excellent system it seems to have been, judging by the splendid specimens of workmanship in wood-work, metal-work, porcelain, tapestry, &c., which are still extant; but the extraordinary scientific developments and the huge industrial and commercial expansion of the nineteenth century have left it far behind. Besides, the relation between master and pupil in a day of hand-tools and small workshops is no longer possible in mammoth establishments crowded with machinery. The working unit tends more and more to become a human tool with expert knowledge of only one very small corner of his business. His instruction is as narrow as the shop horizon is wide. Again, the underlying scientific principles are illustrated, not explained, in the workshop. School was always an advantage, but now it is a necessity.

The enlightened peoples who were the first to recognize this have already reaped a rich harvest. In 1870 some 64 per cent of the Germans lived on farms, now only 33 per cent. That is, in thirty years Germany has been changed from a poor agricultural country into a rich industrial and commercial one. France led on the industrial art side, Germany on the scientific, and America is now leading on the practical side of technical instruction. Efforts are being made among the nations to level up all round. Great Britain, however, still lags behind, although so far as evening instruction for her artisans goes no nation has anything to show comparable with her efforts. The hurry to begin business early, and the meagre provision for secondary and technical education in this country, are serious drawbacks in view of what is being accomplished elsewhere.

So much has been done in different countries in different ways, that it is not an easy task to give an intelligible account of it in a few paragraphs. But taking the artisan, the foreman or under-manager, and the manager or director, as the three legs of the industrial stool, it may be said broadly that there are three corresponding grades of technical instruction in—

(1) Schools intended for apprentices, workmen, artisans, clerks.

(2) Secondary schools for the more intelligent

artisans, leading hands, foremen, draughtsmen, overseers, under-managers.

(3) Technical high-schools or universities for those with the necessary high entrance qualifications, who are intended ultimately to be able to fill the highest and most responsible positions, e.g. head-draughtsmen, designers, managers, directors, proprietors of works, architects, chemists, &c.

(1) In some countries on the Continent, notably France, the apprenticeship problem is in some trades met in an entirely modern way, viz. by regular apprenticeship schools (*ateliers d'apprentissage*). A progressive system of workshop instruction is given with the object of improving on and superseding the old system. Trade schools are also general, in which not only the processes and manipulation of the various industries are taught, but the general principles as well. Drawing, both freehand and mechanical, mathematics, mechanics, and physical science are very commonly taught, at least in their elementary stages. In the little kingdom of Saxony, e.g., there are no less than 250 trade schools of one kind and another. In this country much has been done by the Science and Art Department on the theoretical, and by the City and Guilds of London Institute on the practical side, to encourage the formation of evening science and technological classes. In addition to these, it may be said that where modern methods are fully carried out in the elementary day-schools of a country, technical education really begins in the kindergarten, and in the system of manual training now so generally adopted the pupils acquire dexterity in using hand-tools, a most desirable adaptation of elementary education to the needs of children who are to become the skilled artisans of after-years. The commercial side of technical education gets a corresponding beginning in continuation-schools, and girls get instruction both in these and in the elementary day-schools in practical home duties.

(2) The middle division, that for the non-commissioned officers and subalterns of the industrial and commercial army, is not so fully represented as either of the other two divisions. The best examples of institutions for secondary technical instruction are to be found on the Continent. The *Techniken* of Germany and Switzerland, the industry schools of Bavaria, the *écoles des arts et métiers* of France, and the technical institutes of Italy, are more clearly defined in their aim and work than anything we have here or in America. Engineering, building, chemical technology, industrial art, and commerce are all represented in such schools in regular day courses of instruction of from three to five half-years. These schools seem to have found a distinct place. A *Monotechnikum* for mechanical engineering, for example, started at Bingen on the Rhine in 1897 with 143 students, had 487 students attending in the winter of 1899. The French secondary schools make practical shop-work the main feature of their instruction. The Finsbury Technical College, London, is perhaps the best English example of a higher intermediate school.

(3) As a matter of history the higher technical education came first. The *École Polytechnique* and the *Conservatoire des Arts et Métiers* of Paris were the first institutions each of their kind to work on the higher planes of technical instruction. But at the present time the system is so grown that there are now thirty-six technical universities in Europe, attended by 30,370 students, and in America there are now about a hundred reputable technical and engineering schools, annually graduating about 1000 students into the constructive professions. On the



Continent the tendency is to separate the higher technical instruction from the universities, so that each may pursue their separate aims untrammelled by the other; but in Britain and America for the most part the newer faculties are being developed and worked alongside the old.

The typical German technical university consists of schools in architecture, engineering, chemical technology, mathematics, and natural science, with specialization in other departments according to the requirements of the city, district, or province, e.g. mining and metallurgy at Aachen, textile fabrication at Brunswick, agriculture at Munich, &c. The courses of instruction are both comprehensive and thorough. A marked feature of them is the greater and greater attention that is being given to laboratory work and practical exercises. In American engineering colleges this side of the instruction has been still further developed, a complete set of workshops for manual and technological training being a characteristic part of the system. In the technical universities all over the world degrees are now conferred of all grades in all the departments.

On the commercial side the higher education is as yet but poorly developed, although Belgium has led the way since 1853, and has been conferring the degree of 'Licentiate of Commercial Science' at the *Institut Supérieur de Commerce* of Antwerp since 1876. The course is of two years' length, with an optional third year. France has somewhat similar two years' courses in eleven higher schools of commerce. In England the new University of Birmingham has set the example by establishing a commercial faculty. In 1890 the Wharton School of Finance and Economics of the University of Pennsylvania was the only institution in America offering a higher commercial course of study than the ordinary business colleges. But in 1898 the University of California instituted a four years' course 'for the scientific study of commerce in all its relations', and in the same year Chicago instituted a college of commerce and politics. As a valuable contributory to the higher commercial education, apart from universities, the German non-classical secondary schools (real- und oberreal-schulen) are being credited with much of the commercial success which Germany has attained in recent years, but steps are being taken to establish universities. The Saxon government has sanctioned a scheme for one at Leipzig, and others are spoken of in various trade centres of Germany.

**TEDDINGTON**, a town of England, in the county of Middlesex, on the Thames, here crossed by two bridges, about 13 miles south-west of London. The second lock on the Thames is at Teddington, being the point up to which the jurisdiction of the port of London extends. It has a town-hall, a fine parish church and other churches, a cottage hospital, &c.; a good deal of market-gardening is carried on. Pop. (1891), 10,052; (1901), 14,029.

**TEEL**. See **SESAMUM**.

**TEFF** (*Poa abyssinica*), a grain extensively cultivated in Abyssinia (which see).

**TELAUTOGRAPH**, an instrument invented by Elisha Gray for the instantaneous transmission to a distance of an exact copy of a written message, a drawing, &c. The sender writes or draws his communication on a roll of paper attached to the transmitter, and the communication is at once reproduced on a similar roll in the receiver at the other end. The movement to be transmitted is divided into two components, which operate on pulleys by means of threads, so producing alternating currents in the wire. These act on electro-magnets in the receiver, and ultimately the two movements are re-combined

and made to move a kind of mechanical pencil, whose motions exactly reproduce those of the sender's pencil. It can be used on the same wires as a telephone, with which it may be combined. The message can be sent even when there is no one to receive it at the moment, and interception by tapping is impossible.

**TELEGONY**. In all parts of the world it has long been by many assumed that offspring inherit characters not only from their actual parents, but also from previous mates (if any) of their parents. This, the doctrine of 'harking' or 'throwing' back to a previous mate of one or both of the parents (which is obviously quite different from the doctrine of reversion, i.e. throwing back to remote ancestors), is now known as *telegony*—from Greek *tele*, at a distance, and *gonos*, offspring. Were an Arab mare after bearing a mule foal to an ass to bring forth a mule-like foal to a pure-bred Arab horse, we should have a case of telegony, i.e. evidence that the mare had been 'infected', to use the old term, by a previous mate. Again, if a long-horned Highland bull which had been used for crossing hornless Galloway cows were subsequently to get Galloway-like calves from pure-bred Highland cows, we should have another form of telegony. If, on the other hand, two high-caste whole-coloured Arab mares—full sisters which had never previously bred—were each to produce to the same Arab horse a foal with a number of zebra-like markings, we should have a case of reversion, a throwing back towards a remote striped ancestor. Even if one of these mares had previously been mated with a zebra, the inference that she had been 'infected' would not be justified. That breeders of domestic animals so universally believe in the 'infection' doctrine is not surprising, for in the absence of a better knowledge of the laws of heredity, it was almost inevitable that the difference between a previous mate and a remote ancestor should be lost sight of. It is, however, remarkable that Agassiz, Herbert Spencer, Darwin, and other naturalists were firmly persuaded of the truth of the 'infection' hypothesis; that after a careful consideration of so-called instances of 'infection' Romanes and many others believed that in at least 2 or 3 per cent of cases 'infection' undoubtedly took place; and that even Weismann—though satisfied telegony had not been proved—was quite prepared to admit the possibility of 'infection'. What is still more surprising is, that biologists accepted almost without criticism the breeders' views; that instead of attempting to verify their statements by means of carefully-controlled experiments, they at once set about speculating as to how the assumed 'infection' was accomplished—some, including Herbert Spencer, asserting that the infection was indirect, reaching the germ cells through the tissues of the dam; others, including Romanes, believing that the female germ cells were directly infected by the unused germ cells of a previous mate.

Obviously, if there is such a thing as telegony, and especially if the infection is indirect, the characters of quite a number of varieties or breeds may in course of time be accumulated in one individual. It is equally obvious why believers in the infection theory endeavour to improve their inferior dams by first mating them with high-class sires, and on the other hand regard such of their stock as have been crossed either by accident or design with other breeds as ever afterwards incapable of yielding pure-bred offspring.

Breeders of dogs with rare exceptions are firm believers in the infection doctrine, and they seldom hesitate about getting rid of such members of their kennels, however valuable, as happen to have

formed ill-assorted or unsuitable alliances. Amongst breeders of dogs the late Sir Everett Millais had a deservedly high reputation. In his *Two Problems of Reproduction*, Sir Everett says: 'In a breeding experience of nearly thirty years' standing, during which I have made all sorts of experiments with pure-bred dams and wild sires, and returned them afterwards to pure sires of their own breeds, I have never seen a case of telegony, nor has my breeding stock suffered'. Millais further tells us that the enormous number of cases of infection he had heard of by making enquiries at home and abroad 'would not bear a critical inspection for a moment'. Yet Millais ranked himself amongst the believers in the infection doctrine; he believed that infection did occur, but was 'exceedingly rare and therefore abnormal', though for even this modified belief in telegony he evidently had but a very slender basis of actual evidence.

Dogs having had a multiple origin—having sprung from several species—are in many ways ill adapted for experiments in heredity. But as infection is supposed to be common in the dog family, the results of one or two experiments with dogs may be given. A virgin deer-hound (Mona) crossed with a Dalmatian had seven pups—six nearly black, one gray; the dark ones, in size, build, and coat were not unlike pointers, the gray one was more like a lurcher, with a skull resembling that of the ancient hound known to have existed in Neolithic times. In other words, the offspring, though showing few spots, took far more after the specialized and less ancient Dalmatian or spotted carriage-dog than the more ancient deer-hound. The hound Mona in course of time had five pups to a pure-bred deer-hound. All five grew into deer-hounds pure and simple. A second deer-hound produced equally pure pups after having a litter to a retriever. In neither case was there any indication whatever of infection. Some breeders assert that the infection, though not apparent in the offspring of the infected dam, will be sufficiently evident in her grandchildren. But in many cases on record there was no evidence of infection either in the first or in subsequent generations.

Breeders of horses have long believed that colts frequently 'hark' back to a previous mate of the dam. This is not only supposed to take place when the previous mate belongs to a different species or variety, but even when the previous mate only differs from the subsequent one in some minute and unimportant character, such as a patch of colour or some peculiarity in make, gait, or disposition. If one for a moment forgets the all-important fact that about 50 per cent of the offspring take more after the remote than the immediate ancestors (i.e. the parents), it is often difficult to avoid adopting the telegony hypothesis. If, on the other hand, it is eventually fully realized that for untold ages there have been two perfectly distinct kinds of horses in Europe, and that for centuries the indigenous varieties have been again and again intercrossed with Ethiopian and Oriental races, it will be easier to see in many of the supposed cases of reversion to a previous mate of a similar or closely-related breed instances of reversion to a comparatively recent ancestor.

This being so, reference need only be made to cases in which it is assumed the dam was infected by a sire belonging to a different species, as a mare by an ass. But though this view has long prevailed, trustworthy evidence of this particular form of infection is conspicuous by its absence. Baron de Parana of Brazil gives the following testimony: 'I have many relations and friends who have large establishments for the rearing of mules, where they

obtain from 400 to 1000 mules in a year. In all these establishments, after two or three crossings of the mare and ass, the breeders cause the mare to be put to a horse, yet a pure-bred foal has never been produced resembling either an ass or a mule.' This statement, coming as it does from a trained observer who for years has been breeding zebra and other equine hybrids, makes it difficult for us any longer to believe that mares are liable to be infected when mated with the ass, and there is a like want of evidence that a she-ass has ever been infected by either a horse or a zebra. It is, however, conceivable, though highly improbable, that though a mare escapes infection when bred with an ass, she may be 'corrupted' when mated with a 'gaily-painted zebra'. In 1820 Lord Morton sent to the president of the Royal Society an account of a chestnut mare that, after having a hybrid foal to a quagga, produced three colts to a black Arabian horse, one of which was in some respects more zebra-like than the quagga hybrid. Had it not been for this communication to the Royal Society, it may be safely said the 'infection' doctrine would never have secured the wide-spread influence it has so long retained. But as stripes are not uncommon in high-caste Arabs, the presence of indistinct markings on one of the colts by the black Arabian stallion may be thus explained; and when the whole evidence is carefully weighed, the conclusion is inevitable that, as Weismann and others long ago pointed out, we have not in Lord Morton's mare satisfactory evidence of infection.

Since 1895 a large number of experiments have been made by the writer with members of the Equidae or horse family (at Penicuik, Midlothian), with a view to give telegony a chance of showing itself. These experiments have in a sense been controlled by Baron de Parana in Brazil. The experiments continuously carried on at Penicuik for seven years have afforded very striking evidence of variation and of reversion to previous ancestors, but in no single instance any evidence whatever of reversion to a previous mate.

By way of illustration two experiments may be shortly referred to. 'Mulatto', a nearly black West Highland pony mare lent by Lord Arthur Cecil, mated with the zebra 'Matopo', produced in 1896 the very richly-striped hybrid 'Romulus'. In 1897 she had a foal (her second) to a high-caste gray Arab horse (Benazrek). This foal at birth presented a number of indistinct stripes, which were at first supposed to be due to infection. It was, however, found that two members of Mulatto's special strain who had never seen a zebra had foals with still more distinct markings when mated with the West Highland pony 'Loch Corrie'; and further, that in a pure-bred Arab filly (Fatima) of the Benazrek strain, there are permanent bars on the legs and indistinct stripes across the withers. In Mulatto's second foal the markings entirely vanished with the foal's coat. 'Tundra', a skewbald Iceland pony, had first a pure-bred dun-coloured Iceland foal. In 1897 she had by Matopo a dark but richly-striped zebra hybrid. In 1898 she had a foal, in colour the image of herself, by a bay Shetland pony; in 1899, a hybrid with far more stripes than his zebra sire—stripes which, owing to the body colour being of a light dun tint, make the hybrid almost as conspicuous as a zebra. In 1900 Tundra had a foal by a bay Arab, in colour again very like herself, and, like the 1898 foal, not in the most remote way suggesting a zebra. The offspring of the subsequent foals, i.e. of foals born after hybrids, however bred, failed, like their parents, to lend any support to the telegony doctrine.

Although many other experiments have been made with sheep, rabbits, rats, mice, and other mammals, fowls, pigeons, and other birds, it will suffice if the results of experiments with oxen are given. For experiments with cattle the Shetland ox was selected. Two dun-coloured specimens—one with entire and one with divided ear-tips—were selected, and first bred with a shorthorn bull, the result being brown and white calves presenting the more striking traits of the shorthorn. One of the dun cows was next mated with a bull of her own breed, the other with a Jersey. The pure-bred calf has the ear-tips cleft as in her dam and in every respect conforms to the Shetland breed, the Jersey-Shetland calf is as nearly as possible intermediate between her parents. In no point can either of the subsequent calves be said to resemble either a pure shorthorn or their cross-bred half-brothers.

Experiments with Indian and various kinds of British cattle invariably yielded the same results. Breeders of cattle seem to think that their bulls are quite as liable to suffer from infection as their cows. Of this kind of infection the writer has completely failed to obtain any proof. A consideration of the evidence thus far obtained inevitably leads to the conclusion that there is no such thing as either indirect or direct 'infection of the germ'—that, in other words, there is no likelihood of the fact of telephony ever being established.

**TELEPATHY**, a general name used to include all the phenomena, or alleged phenomena, which seem to support the belief that one mind can receive impressions from another directly by 'thought-transference', without any known means of intercommunication. 'Thought-reading' or 'mind-reading' comes under this term, but so-called mind-readers often require to come into direct contact with the person whose mind is to be read; and in such cases it is believed that the percipient is really guided by muscular movements on the part of the subject, so that muscle-reading rather than mind-reading proper is what really takes place. Cases of real telepathy are those in which there is no personal contact, and yet one person can read, or guess, what is in another person's mind. If, for instance, the person has in his mind the idea of a diagram, figure, or object, this can be approximately known and delineated through the telepathic power of the percipient. Certain phenomena of hypnotism may be classed as telepathic; and it is by telepathy that the alleged cases of apparitions of the living are explained, especially cases in which a person at the point of death appears to another at a distance. See **PSYCHICAL RESEARCH** in SUPP.

**TELL EL-AMARNA**, an interesting group of ruins in Egypt, on the east bank of the Nile, about 50 miles north-west of Assiout. It was the capital of Egypt under Amenophis IV. (see **EGYPT**), but its period of prosperity was very brief. The principal relics which have been excavated, chiefly by Prof. Petrie in 1891-92, are fine stucco pavements belonging to the former palace, and an important series of tombs. A number of cuneiform tablets found here throw much light on the foreign relations of Egypt in the time of Amenophis IV.

**TELL EL-KEBIR**, a village of Lower Egypt, 18 miles to the south-east of Zagazig, between Cairo and Ismailia. Here on Sept. 13, 1882, Sir Garnet (now Viscount) Wolseley inflicted a crushing defeat on Arabi Pasha.

**TELUGU**, or **TELINGA**, one of the languages of India, belonging to the Dravidian group, and spoken by about twenty millions of people in Madras, Hyderabad, Mysore, Bombay, Central Provinces, Burma, Berar, and other parts. The Telugu are the

most numerous branch of the Dravidian race, but are less enterprising than the Tamils, who occupy the country to the south of them. The language is allied in roots to the Tamil language, but differs considerably otherwise.

**TEMBULAND**, a district or dependency of the Cape Colony, in the east of which it is situated, one of the Transkei districts, adjoining Pondoland and Griqualand East; chief town Umtata. Pop. 180,415 (5179 Europeans).

**TENNENT**, **SIR JAMES EMERSON**, an author of some note, especially for his work on Ceylon, which has long been the standard work on the subject; born at Belfast, April 7, 1804; died in London, March 6, 1869. He was the son of William Emerson, a wealthy merchant, and assumed the name of Tennent in 1832, after his marriage with the only daughter of a rich Belfast banker of that name. After graduating at Trinity College, Dublin, he entered on a course of travels through Europe and the Levant. In Greece he met Lord Byron, and, under the influence of his enthusiasm for the independence of Greece, wrote *A Picture of Greece* in 1825 (1826), *Letters from the Ægean or Grecian Islands* (1829), and *A History of Modern Greece* (1830). In 1831 he was called to the bar, and in 1832 was returned by Belfast to the first reformed Parliament. He was at first a supporter of the Liberals, but in subsequent parliaments became an active defender of the Conservative policy of Sir R. Peel. From 1841 to 1843 he was secretary to the India board, and in 1845 was knighted and appointed civil secretary to the government of Ceylon, a post which he occupied till 1850. On returning to England he again entered Parliament, and was secretary to the poor-law board in 1852. He was subsequently one of the secretaries to the board of trade, from which office he retired with a baronetcy in 1867. His principal work is Ceylon, an *Account of the Island, Physical, Historical, and Topographical* (1859). A portion of this work was published with additions and illustrations, under the title of *Sketches of the Natural History of Ceylon* (1861).

**TENNIEL**, **SIR JOHN**, artist, was born in London in 1820, and educated at Kensington. He early manifested artistic ability, but received no regular art training. In 1845 he was selected by open competition to paint a fresco in the Houses of Parliament at Westminster, but he is better known as a book-illustrator and a cartoonist in Punch, on whose staff he worked during the fifty years 1851-1901. Among the books illustrated by him are *Alice's Adventures in Wonderland*, and its sequel, *Through the Looking Glass*; *Æsop's Fables*; *Lalla Rookh*; and the *Ingoldsby Legends*. He is a member of the Royal Institute of Painters in Water Colours, and in 1893 he received the honour of knighthood. See *Ewart's Toilers in Art* (1891).

**TERRY**, **ELLEN ALICE**, actress, was born at Coventry on Feb. 27, 1848. She made her first appearance on the stage in 1856 at the Princess's Theatre, under the management of Mrs. Charles Kean, and she afterwards acted in the *Royalty* and *Haymarket Theatres*. She was first associated with Henry Irving during a short engagement at the *Queen's Theatre*. After a seven years' absence from the stage, she again made her début in Charles Reade's *Wandering Heir*, and in 1875 she was engaged for the *Prince of Wales's Theatre* by Mr. Bancroft. Next year she acted a leading part in *Lytton's House of Darnley* at the *Court Theatre*, under Mr. John Hare, and on Dec. 30, 1878, she made her first appearance with Mr. Irving at the *Lyceum Theatre*, whose management he had recently taken over. Her rôle on that occasion was *Ophelia*,

always one of her finest parts, and among the numerous other parts sustained by her during her long association with the Lyceum and Sir Henry Irving are *Pauline* (The Lady of Lyons), *Portia* (Merchant of Venice), *Juliet*, *Beatrice*, *Henrietta Maria* (Wills's Charles the First), *Viola*, *Olivia* (Wills's Olivia), *Margaret* (Wills's Faust), *Lady Macbeth*, *Lucy Ashton* (Merivale's Ravenswood), title-rôle in *Reade's Nance Oldfield*, *Queen Katherine* in *Henry VIII.*, *Cordelia*, *Rosamund* (Tennyson's Becket), *Guinevere* (Carr's King Arthur), *Imogen*. She has several times visited America in company with Sir Henry Irving. She married Mr. Wardell in 1864.

**TERUEL**, a town of Spain, capital of the province of the same name, on a hill near the Guadaluvar, 140 miles east of Madrid, 72 miles north-west of Valencia. It has a somewhat ancient appearance, and its streets are very narrow. Its buildings include a Gothic cathedral, a bishop's palace, and a priests' seminary. Pop. (1897), 9423.

**TETTENHALL**, a town of England, in Staffordshire, 2 miles west of Wolverhampton, of which it is a residential suburb, with a church of great antiquity (restored), a Congregational church, an institute, the Wolverhampton waterworks, &c. Pop. (1891), 5145; (1901), 5337.

**THEODORA**, the wife of the Byzantine emperor Justinian, of low birth, was at one time a dancer on the stage, and notorious for licentiousness. She latterly assumed the character of a pious benefactor of the church, and died in 548, aged forty. See **JUSTINIAN I.** and **PROCOPIUS** (historian).

**THEODORE II.** See **ABYSSINIA**.

**THERAPEUTICS.** See **MEDICINE**.

**THIRLMERE**, a small lake in the county of Cumberland, England, about 4 miles s.e. of Keswick, 2½ miles long by ¼ broad. Its natural level is 533 feet, but in order to employ it as a reservoir for supplying Manchester with water its level has been raised, and it is intended to raise it still further to 584 feet. The Manchester water-works were constructed in 1885-94 at a cost of £4,000,000, and a supply of 50,000,000 gallons a day is obtained.

**THOMAS, AMBROISE**, French musical composer, son of a music teacher, was born at Metz on Aug. 5, 1811. He studied in the Paris Conservatoire, and in 1832 gained the Grand Prix, which enabled him to continue his studies in Italy at the expense of the government. Immediately after returning to France he began to write for the Opéra Comique, his first opera being *La double Échelle* (1837). To his first period, characterized by graceful elegance, belong also *Betty* (1846) and *Mina* (1843). *Le Caïd* (1849), an opéra bouffe, marks the beginning of his second style, more innovating and poetic than his first, and represented chiefly in *Le Songe d'une Nuit d'Été* (1850), *Raymond* (1851), *Psyché* (1857), and *Le Roman d'Élvière* (1860). He is best remembered, however, by the more serious works of his later years, *Mignon* (1866), *Hamlet* (1868), and *Françoise de Rimini* (1882). He became professor of composition at the Paris Conservatoire in 1852, and in 1871 he succeeded Auber as director. His non-operative works include a *Messe Solennelle* (1857), a *Marche Religieuse* (1865), cantatas, songs, pianoforte and string pieces, &c. He died in Paris on Feb. 12, 1896.

**THOMAS, ARTHUR GORING**, English musical composer, born at Ratton Park, Sussex, on Nov. 20, 1850, was educated for the Indian civil service at Haileybury College, but owing to ill-health gave up his intention. He received his musical education at Paris under Émile Durand and in the Royal Academy of Music under Sullivan and Prout, and at a later period he studied orchestration under

Max Bruch. His opera, *The Light of the Harem*, was produced with considerable acceptance while he was still a student in the Academy, and in 1883 his second opera, *Emeralda*, was produced by Carl Rosa's company at Drury Lane and elsewhere with much success. *Nadeahda* followed in 1885, and *The Golden Web*, as completed by S. P. Waddington, was posthumously produced at Liverpool in 1893. Besides these operas he composed a choral ode, *The Sun Worshipers*, produced at the Norwich Festival in 1881; a cantata, *Out of the Deep*; another cantata, *The Swan and the Skylark*, completed by Sir C. V. Stanford and produced at the Birmingham Festival of 1894; several orchestral and violin pieces; numerous songs, &c. He died on March 20, 1892. He is commemorated by the Goring Thomas scholarship at the Royal Academy of Music.

**THOMSON, WILLIAM**, Archbishop of York, was born at Whitehaven, Feb. 11, 1819, and educated at Shrewsbury School and Queen's College, Oxford, of which he was successively fellow, tutor, and head. Ordained deacon in 1842, he was curate at St. Nicholas, Guildford, and Cuddesdon, near Oxford, between that year and 1847, when he became tutor of his college, of which he became provost in 1855. In 1861 he edited a series of essays by various writers under the title *Aids to Faith*, intended as a counterblast to *Essays and Reviews*; and in that year also he was raised to the episcopal bench as bishop of Gloucester and Bristol; but before he had held the appointment twelve months he was transferred to the archbishopric of York. He died on Dec. 25, 1890. Dr. Thomson was the author of a number of works, including: *An Outline of the Necessary Laws of Thought* (1842); *The Atoning Work of Christ, viewed in Relation to some Current Theories* (Bampton lectures, 1853); *Crime and its Excuses* (in Oxford Essays, 1855); *Life in the Light of God's Word* (sermons); *Limits of Philosophical Inquiry*; *Design in Nature*; and a series of essays entitled *Word, Work, and Will*.

**THOMSON, SIR WILLIAM.** See **KELVIN** in SUPP.

**THOREAU, HENRY DAVID**, American writer, was born in Concord, Mass., July 12, 1817. His father was a small farmer and pencil-maker. The boy attended school in Concord and Boston, and entered Harvard University, where he graduated in 1837. For some years thereafter he was engaged in school-teaching, land-surveying, pencil-making, and other handicrafts; but the greater part of his time was occupied in the study of nature and contemplation. It was his constant desire to get close down to the elemental conditions of life, and in order to do this he built a hut, in 1845, on the shore of Walden Pond, in the neighbourhood of Concord. Here he remained for about two years living like a hermit, while labouring, studying, writing, and meditating. When Thoreau quitted the solitude of Walden Pond he went back to Concord, lived with his family, and worked at pencil-making. From his college days he had been intimate with Emerson, he even lived for some time in Emerson's house. When John Brown, the abolitionist, was hanged for the part he took in trying to free the slaves, Thoreau delivered a lecture in his defence (1859), and he continued his crusade against slavery until his death, which took place at Concord on May 6, 1862. Thoreau had none of the ordinary ambitions of authorship; and although he was constantly writing, only two volumes—*A Week on the Concord and Merrimac Rivers* (1849), and *Walden, or Life in the Woods* (1854)—were published during his lifetime. After his death there appeared: *Excour-*

sions in Field and Forest, with a Memoir by R. W. Emerson (1863); The Maine Woods (1864); Cape Cod (1865); Letters to Various Persons (1865); A Yankee in Canada (1866); Early Spring in Massachusetts (1881); Summer (1884); and Winter (1887). From his manuscripts there have also been published Anti-Slavery and Reform Papers (Social Science Series, 1890); Essays (1891); Familiar Letters (1894); and Poems of Nature (1896). He also contributed to various periodicals, such as The Dial and the Atlantic Monthly. See the Poet-Naturalist (1873) by William Ellery Channing, the Life by Franklin B. Sanborn in the American Men of Letters Series (1882), and those by Henry S. Salt (1890 and 1896). **THORNABY-ON-TEES.** See STOCKTON.

**THORNBURY, GEORGE WALTER**, miscellaneous writer, was born in London on Nov. 13, 1828. He was intended for the church, but he studied art for a short time with a view to becoming an artist. Beginning his literary career in Bristol at the age of seventeen, he soon after settled in London, where for thirty years he was almost continuously at work writing for Household Words, Once a Week, the Athenæum, &c. Among his numerous works are: The Courts of the Crystal Palace in Hyde Park (1851); Lays and Legends (1851); Shakspeare's England (1856); Art and Nature at Home and Abroad (1856); Songs of the Cavaliers and Roundheads (1857); Life in Spain, Past and Present (1860); British Artists from Hogarth to Turner (1861); Two Centuries of Song (1867); Criss Cross Journeys (1873); Legendary and Historic Ballads (1875); and a Life of Turner, under the supervision of Ruskin (1861). He also wrote novels, and the first two of the six volumes of Old and New London. He died at Camberwell House Asylum on June 11, 1876.

**THORNHILL**, an urban district of England, in Yorkshire (West Riding), on the river Calder, 2 miles south of Dewsbury, in which parliamentary borough it is partly included. It has an ancient church, some chapels, local board offices, an endowed school, collieries, glass-works, &c. Pop. (1891), 9606; (1901), 10,290.

**THORNHILL, SIR JAMES**, English painter, was born at Melcombe Regis in 1675, and died at Thornhill, Dorset, on May 13, 1734. He was much engaged in the decoration of palaces and public buildings, in which his chief works are to be found. Among his best efforts may be mentioned the dome of St. Paul's, the saloon and refectory at Greenwich Hospital, and some rooms at Hampton Court. His forte was in the treatment of allegorical subjects. He became sergeant-painter to the king in 1720 and was knighted in the same year. In 1722-34 he was M.P. for his native town. Hogarth married Thornhill's daughter in 1729.

**THORNYCROFT, WILLIAM HAMO**, sculptor, was born in London on March 9, 1850. He spent his early years in Cheshire, and received his education at Macclesfield grammar-school and University College School, London. After working in his father's studio for two years he entered the Royal Academy schools in 1869. He first exhibited at the Academy in 1871, and in the same year he went to Italy. He gained a gold medal from the Academy in 1875 for a group representing A Warrior bearing a Wounded Youth from the Field of Battle, and in 1880 he completed his Artemis for the Duke of Westminster. He became A.R.A. in 1881 and R.A. in 1888. He was made an honorary member of the Royal Academy of Munich in 1889, and he received a *médaille d'honneur* at the Paris exhibition of 1900. His principal works include, in addition to those mentioned, Tenebris (1881), purchased for

the nation from the Chantrey fund and now in the Tate Gallery; The Mower (1884); a memorial of the poet Gray (1885) at Pembroke College, Cambridge; a bust of S. T. Coleridge (1885) in Westminster Abbey; The Sower (1886); a memorial of Sir John Goss in the crypt of St. Paul's Cathedral; the National Memorial to General Gordon in Trafalgar Square, London; Medea (1888); a statue of John Bright (1890) in Rochdale; The Mirror (1890), his diploma work; Summer (1893); The Joy of Life (1896); a monument of W. O. Stanley at Holyhead (1897); The Bather (1898); Lot's Wife; and statues of the following: Lord Granville (Houses of Parliament), Queen Victoria (Royal Exchange, London), Archbishop Thomson (York Minster), Bishop Goodwin (Carlisle Cathedral), Oliver Cromwell (1899, Houses of Parliament), Dean Colet (1899), and W. E. Gladstone (Glasgow, 1902).

**THORPE, BENJAMIN**, a distinguished Old English scholar, born in 1782, studied under Rask in Copenhagen, and died after a life of strenuous scholarly activity at Chiswick on July 19, 1870. He was a pioneer in the study of Anglo-Saxon, and his translation of Rask's Anglo-Saxon Grammar (1830) and his *Analecta Anglo-Saxonica* (1834) were at one time the standard English works of their kind. He edited Caedmon's biblical poem (1832); the Anglo-Saxon version of Apollonius of Tyre (1834); Ancient Laws and Institutes of England (1840); The Holy Gospels in Anglo-Saxon (1842); Codex Exoniensis (1842); The Homilies of the Anglo-Saxon Church (1843-46); Florence of Worcester's Chronicle (1848-49); Beowulf (1855); The Anglo-Saxon Chronicle (1861); *Diplomatarium Anglicum Ævi Saxonici* (1865), a valuable supplement to Kemble's great *Codex Diplomaticus*; and The Edda of Sæmund the Learned (1866). He also translated Lappenberg's History of England under the Anglo-Saxon Kings (1845) and History of England under the Norman Kings (1857), adding introductions and notes of his own. Pauli's well-known Life of Alfred the Great was translated by him in 1854.

**THOUGHT-READING.** See TELEPATHY in SUPP.

**THURSDAY ISLAND**, a small island of Queensland, in Normanby Sound, Torres Straits, one of the Prince of Wales group. It is a government station, and the harbour—Port Kennedy—is one of the finest in this quarter. There are government buildings, a French Roman Catholic and an Anglican church, a hospital, a school of arts with library, &c. During the period of the south-east monsoon (March-October) the climate is excellent, but in the other months there is much rain accompanied not infrequently with great heat. Thursday Island is in the direct track of all vessels reaching Australia by Torres Straits, and is the centre of an important pearl and bêche-de-mer fishery. It is also a dépôt of trade with New Guinea, and has been converted into a coaling station, fortifications having also been constructed. The island is the head-quarters of the bishopric of Carpentaria, which was formed in 1900. Pop. (1900), 1431, of whom 644 were European and 385 Japanese.

**THYLACINE**, the Tasmanian wolf. See WOLF.

**THYMOL**, a crystalline substance, one of the phenol group, obtained from the volatile oils of thyme and certain other plants. It is a strong antiseptic and disinfectant. It is used in surgery, and is also employed as a gargle in sore-throat, an inhalation in lung affections, and in other ways.

**TIELE, CORNELIUS PETRUS**, a distinguished Dutch writer on comparative religion, was born at Leyden on Dec. 16, 1830. He was educated at Leyden and Amsterdam, and in 1853 became pastor

of the Remonstrant congregation at Moordrecht. Three years later he removed to Rotterdam, where he became closely associated with Albert Réville, whose liberalism in theological matters he fully shared. In 1873 he was appointed director of the Remonstrant theological seminary at Leyden, a post which he occupied till his death. During 1877-1901 he held the professorship of the science of religion in the University of Leyden, a chair specially created for him. He died at Leyden on Jan. 11, 1902. In 1896-98 he delivered the Gifford lectures in the University of Edinburgh. He was one of the pioneers in the study of comparative and historical religion, and among his chief works are: *The Religion of Zoroaster* (1864); *Comparative History of the Egyptian and Mesopotamian Religions* (1869-72); *History of Religion in Antiquity* (1892-96; second edn., 1901); *Western Asia in the Light of the Most Recent Discoveries* (1893); *Elements of the Science of Religion* (1899), his Gifford lectures; and articles in the *Encyclopædia Britannica* and *Encyclopædia Biblica*.

**TIGER-CAT**, a name of not very definite signification, sometimes given to some of those animals of the family *Felidæ* which are of middling size, and resemble the tiger in their form or markings, such as the chati, the margay, the ocelot, the serval, &c., which see.

**TIGER-LILY** (*Lilium tigrinum*), a native of China, common in English gardens, having scarlet flowers turned downward, the perianth being reflexed. It is remarkable for having axillary buds on the stem. The bulbs are eaten in China and Japan.

**TIRASPOL**, a town of Russia, in the government of Cherson, on the left bank of the Dniester, 60 miles north-west of Odessa, with tobacco and other industries. Pop. (1897), 27,585.

**TITUSVILLE**, a city of the United States, in Crawford county, Pennsylvania, in the north-west of the state, 100 miles north of Pittsburgh. It owes its rise to the petroleum obtained in its immediate neighbourhood and refined here. Pop. (1900), 8244.

**TIZI-OUZOU**, a town of Algeria, about half-way between Algiers and Bougie. Pop. (1896), 26,007.

**TODHUNTER**, ISAAC, mathematician, son of an independent minister, was born at Rye on Nov. 23, 1820. He was educated in two Hastings schools and became a teacher in a school at Peckham. He attended the evening classes of University College, London, and graduated B.A. of London University in 1842. He entered St. John's College, Cambridge, in 1844, and graduated in 1848 as senior wrangler and first Smith's prizeman. He was elected a fellow of his college in 1849 and became a lecturer and tutor. He was elected a fellow of the Royal Society in 1862. Two years later he vacated his fellowship on the occasion of his marriage, but in 1874 he was appointed to an honorary fellowship. He died of paralysis at Cambridge on March 1, 1884. Dr. Todhunter was a man of high attainments in various branches of learning, but he is best known as the author of numerous mathematical text-books, which are not yet entirely superseded. His most important works are: *A Treatise on the Differential Calculus* (1852); *Analytical Statics* (1853); *Plane Co-ordinate Geometry* (1855); *Examples of Analytical Geometry of Three Dimensions* (1858); *Algebra* (1858); *Trigonometry* (1859); *The Theory of Equations* (1861); *History of the Progress of the Calculus of Variations during the Nineteenth Century* (1861); an edition of Euclid's elements (1862); *History of the Mathematical Theory of Probability from Pascal to Laplace* (1865); *History of the Mathematical Theories of Attraction from Newton to Laplace* (1873); *The Conflict of*

*Studies* (1873); *Laplace's Functions* (1875); and *History of the Theory of Elasticity* (ed. Karl Pearson, 1886).

**TODLEBEN**, EDUARD IVANOVITCH, COUNT, Russian military engineer, the son of a shopkeeper, was born at Mitau, in Courland, on 20th May, 1818. He received his early education in the schools of Riga, whence he entered the College of Engineers at St. Petersburg, and served with the forces despatched to attempt the reduction of the Circassians in 1848. On the outbreak of the Russian war in 1854 he was second captain in the corps of engineers destined for field service, and having distinguished himself under General Schilders in the Danube campaign, proceeded to the Crimea. Here he succeeded, under the continuous fire of the enemy, in converting Sebastopol, a comparatively open town, into a fortress, which resisted for more than a year all the attacks of the allies. For many years after the peace of 1856 he had no active employment, and devoted himself to scientific and literary studies. He wrote a work on the defence of Sebastopol, and in 1865 visited England, where he was most cordially received. In the Russo-Turkish war, after the defeat of the Russians before Plevna (11th Sept. 1877), Todleben was sent to reduce that stronghold. The place was soon completely invested, and after a heroic resistance, Osman Pasha, the Turkish commander, was compelled to surrender at discretion. For his services Todleben was created a count. He was appointed to the command of one of the corps of occupation, with headquarters at Adrianople, and afterwards held the command-in-chief of the Russian army before Constantinople. He was subsequently governor, first of Odessa and afterwards of Wilna. He died 1st July, 1884.

**TOGOLAND**, a German protectorate in West Africa, on the Slave Coast, bounded on the west by the British Gold Coast Colony and on the east and north by Dahomey. The coast-line of Togoland is only 32 miles in length, but the territory broadens considerably farther north. The total area of the protectorate is estimated at 33,000 square miles, and the population at 2,500,000. The number of Europeans is quite small, and nearly all are Germans. The coast region is low and unhealthy, but inland there are several ranges of hills and many fertile tracts, especially in the western part of the protectorate. Streams are numerous. The capital is Lome, on the coast, near the western boundary, and the chief ports are Little Popo, Porto Seguro, Bagida, and Lome. Oil-palms, coco-palms, bananas, caoutchouc, and dye-woods grow throughout the colony, and among plants cultivated by the natives are maize, tobacco, rice, sugar-cane, and earth-nuts. The coco-nut, coffee, and gum tree have been extensively planted near the coast settlements. Cattle, sheep, goats, poultry, and pigs are reared. Weaving, pottery, straw-plaiting, &c., are practised by the natives. The exports consist chiefly of palm kernels, palm-oil, ivory, gum, earth-nuts, and copra. Education is provided for by the government and the missionary societies. Togoland was declared a German protectorate in 1884.

**TOKELAU**, or **UNION ISLANDS**, a small island group in the Pacific Ocean, belonging to Britain, situated about 350 miles north-east of the Samoan islands, and composed of five clusters, whose chief islets are known as Fakaofu or Bowditch, Nukunono or Duke of Clarence, Oatafu or Duke of York, Nassau, and Danger. The total area is 7 square miles, and the population about 1050. There is some trade in copra.

**TOKUSHIMA**, the largest town of the island of Shikoku, Japan, situated on its north-east coast, at



the mouth of the Yocina-gawa, the chief river of the island. Pop. (1899), 61,501.

**TOLAND, JOHN**, deist, was born near Londonderry on Nov. 30, 1670, and was brought up as a Roman Catholic, but went over to Protestantism at the age of sixteen. He was educated at Glasgow University and studied divinity in the University of Leyden. In 1696 he published a work entitled *Christianity not Mysteries*, which may be regarded as opening the prolonged English controversy between deism and orthodoxy. The House of Commons ordered it to be burnt by the common hangman, and Toland met with determined opposition from many quarters, though Locke gave him a certain amount of support. He subsequently supported himself by literary hackwork and various forms of political party service, and he died on March 11, 1722. Besides the work above-mentioned he wrote the following: *A Life of Milton* (1698), in an edition of his prose works; *Memoirs of Denzil, Lord Holles* (1699); *Anglia Libera* (1701), a defence of the Act of Succession; *The State Anatomy of Great Britain* (1717); &c. See **RATIONALISM**, and *Disraeli's Calamities of Authors*, Hunt's *Religious Thought in England*, &c.

**TOLU-BALSAM**, a balsam obtained from a leguminous tree of tropical South America, the *Myroxylon toluiferum*. Tolu-balsam has a brownish-yellow colour, becomes quite hard and may be formed into a powder, has a pleasant aromatic flavour, and is used in certain medicinal preparations, though having little or no virtue of its own.

**TOLUCA**, a city of Mexico, capital of the state of Mexico, 28 miles south-west of the federal capital; situated about 7000 feet above the sea. The city has a cathedral, a theatre, &c., and is noted for its hams and sausages. Brewing, cotton-spinning, soap-making, &c., are carried on. Near it is an extinct volcano of the same name (15,019 feet). Pop. (1900), 25,904.

**TOMBAC, TOMBAK**, an alloy consisting of from about 75 to 85 parts copper, mixed with 25 to 15 parts zinc, and used as an imitation of gold for cheap jewelry. When arsenic is added it forms white tombac.

**TONGAREWA**. See **PENRHYN ISLAND** in SUPP.

**TONK**, a town of India, capital of a native state of the same name in Rajputana, in the Harauti and Tonk Agency. The town is situated near the Banas river, 85 miles south-east of Ajmere, is inclosed by a wall, and has a mud fort. Area of state, 2722 square miles; pop. (1891), 379,944. Pop. of town (1901), 38,759.

**TÖNSBERG**, the oldest town in Norway, situated on a fjord of the same name branching off from Christiania Fjord, with which it has canal communication. Many vessels belong to the town. Pop. (1900), 8620. See **CHRISTIANIA**.

**TONSILLITIS**. See **QUINSY**.

**TONSILS**, in anatomy, two oblong suboval bodies situated on each side of the throat or fauces. Their minute structure resembles that of the closed sacs or follicles of Peyer in the intestine, and their function is not yet understood. See **PALATE**.

**TOOLE, JOHN LAWRENCE**, a well-known comedian, was born in London on March 12, 1833, and educated at the City of London School. After serving for some time as a wine-merchant's clerk he took to the stage, and made his first appearance at the Haymarket in 1852. He then played with great success in Dublin, Belfast, Edinburgh, and Glasgow, and ultimately became a popular favourite in every town of note in the United Kingdom. In 1880 he commenced the management of the Folly Theatre, London, which he afterwards reconstructed

and named after himself. In 1874 he visited America, in 1888 he published his *Reminiscences*, and in 1890 made a successful tour in the Antipodes. He has latterly given up acting. He was one of the most popular actors on the stage, inimitable in his personation of semi-pathetic, semi-ludicrous characters. Among his most successful parts are Paul Pry, Caleb Plummer in the *Cricket* on the *Hearth*, Uncle Dick in *Uncle Dick's Darling*, &c.

**TOOWOOMBA**, a town of Australia, in Queensland, the chief town of the Darling Downs district, at the head of Gowrie Creek, a tributary of the Condamine, 100 miles west of Brisbane. It has numerous churches; a grammar-school, a Christian Brothers college, a technical college, state schools, and other educational institutions; a Roman Catholic convent; a hospital and a lunatic asylum; a fine municipal building (1900) containing the town-hall, school of arts, library, and theatre; a court-house; &c. The industrial works include flour-mills, saw-mills, tanneries, soap-works, jam and fruit factories, and there are vineyards in the neighbourhood. Pop. in 1901, 9137.

**TORMENTIL**. See **POTENTILLA**.

**TORNADO**, a violent cyclonic storm. See **CLONE, HURRICANE, WIND**.

**TORNEÅ** (Finnish, *Tornio*), a small town in North Finland, Russia, at the mouth of the River Torneå, which rises in Sweden and forms part of the boundary between it and Russia.

**TOTARA** (*Podocarpus totara*), a tree of New Zealand, of the yew family, excelled only by the kauri among New Zealand trees for general utility, and most abundant in the central part of North Island. It is from 60 to 80 feet in height, and has a fibrous brown bark, which is deeply furrowed. Its leaves are linear and of a greenish-brown colour. The wood is reddish-brown, clear and straight in the grain, and it does not warp or twist. It is very durable, and is largely used for constructional and other purposes. It is the best of New Zealand timbers for marine purposes.

**TOTONICAPAM**, a town of the Central American republic of Guatemala, 65 miles to the north-west of the capital, in a fruit-producing district, with manufactures of cloth, pottery, &c. The climate is very healthy. Pop. (1893), 25,196.

**TOTTENHAM**, a town of England, in Middlesex, forming a suburb of London, 6 miles north by east of St. Paul's, on the main road north to Hertford. It has an interesting old church (rebuilt and enlarged), modern churches and chapels, a grammar-school, almshouses, and Bruce Castle, a mansion formerly owned by Robert Bruce, the claimant. Tottenham gives name to a parliamentary division of Middlesex. Pop. (1891), 71,343; (1901), 102,519.

**TOTTINGTON**, a town of England, in Lancashire, 3 miles north-west of Bury, with cotton, calico, and soap works. Pop. (1891), 5775; (1901), 6118.

**TOURACO**. See **PLANTAIN-EATERS**.

**TOWER HAMLETS**, one of the parliamentary boroughs of London, lying eastward from the Tower. It comprises seven divisions, namely, Whitechapel, St. George's-in-the-East, Limehouse, Mile-End, Stepney, Bow and Bromley, and Poplar, each returning one member. See **LONDON**.

**TOWNSVILLE**, a town of Australia, the principal city of North Queensland, and the head-quarters of the bishopric of North Queensland, in Elphinstone county, on the banks of Ross Creek, at its mouth in Cleveland Bay, and partly on the slope of Castle Hill, 870 miles north-west of Brisbane. The river is here crossed by a swing-bridge. It has a fine harbour inclosed by breakwaters. The chief build-

ings and institutions are the town-hall, a fine custom-house, a court-house, a large penal establishment, the supreme court, a grammar-school, state and other schools, a school of arts, numerous places of worship, and immigration barracks. There are foundries, a brewery, a soap-factory, ice-works, meat-freezing works, &c. The town is well supplied with water. It is protected by batteries. Pop. in 1901, 12,717.

TOWYN, a market-town and watering-place of North Wales, in Merionethshire, on the coast, 14 miles south-west of Dolgelly. It has a very ancient cruciform church of much interest, nonconformist churches, a good secondary school, and a fine beach. The surrounding country is very beautiful, and near the town there are important slate-quarries. Pop. (1891), 3801; (1901), 3744.

TOYAMA, a town of Japan, near the north coast of Hondo, 170 miles north-west of Tokyo (Yeddo). Pop. (1899), 59,558.

TRAGACANTH, a variety of gum familiarly termed gum-dragon or gum-tragacanth. It is the produce of several species of the genus *Astragalus*, leguminous plants, natives of the mountainous regions of Western Asia. One of the most important species is *A. gummifer*. In commerce tragacanth occurs in small twisted thread-like pieces, or in flattened cakes, in colour whitish or yellowish, devoid of taste or smell. It is demulcent, and is used in coughs and catarrhs, and to make lozenges and pills. It is employed also in calico-printing.

TRAILL, HENRY DUFF, English writer and journalist, of Scottish extraction, was born at Blackheath on August 14, 1842. He was educated at Merchant Taylors' School, from which he went to St. John's College, Oxford, in 1861, graduating B.A. in 1865, B.C.L. in 1868, and D.C.L. in 1873. In 1869 he was called to the bar at the Inner Temple, and in 1871 he was appointed an inspector of returns to the education office. Soon after leaving the university he took to journalism, at first in connection with the Yorkshire Post, and he was successively on the staff of the Pall Mall Gazette (1873-80), St. James's Gazette (1880-82), and Daily Telegraph (1882-97), besides being for a long time a leading contributor to the Saturday Review. He edited the Observer in 1889-91, and from 1897 till his death he was editor of the weekly journal Literature, now absorbed in the Academy. He died in Paddington on February 21, 1900. His separate publications include biographies of Sterne (1882) and Coleridge (1884) in the English Men of Letters series; monographs on Shaftesbury (1886), William III. (1888), Strafford (1889), Lord Salisbury (1891), and Lord Cromer (1897); a Life of Sir John Franklin (1896); volumes of essays entitled The New Lucian (1884), Number Twenty (1892), and The New Fiction (1897); Glaucus: A Tale of a Fish (1865), The Medicine Man (1898, with Robert Hichens), and other plays; From Cairo to the Soudan (1896), a book of travel; England, Egypt, and the Soudan (1900); and two volumes of verse, Recaptured Rhymes (1882) and Saturday Songs (1890), reprinted from the Saturday Review. In 1893-97 he edited Social England, a work on the history of England, with special reference to social and industrial developments.

TRAINING COLLEGES. See NORMAL SCHOOLS.

TRANSKEI, a district of eastern Cape Colony, between the Great Kei and Bashee rivers, inhabited almost entirely by Fingo Kaffirs. It is one of the Transkei Territories, which include also Tembuland, Griqualand East, and Pondoland. These territories are under two chief magistrates, and are subject to

the Native Territories Penal Code. They are well watered, and there is much fine agricultural land, and a number of European farmers have settled here, and carry on farming with much success. The total area is about 18,300 square miles, and the population is about 675,000. The most important centre is Kokstad in Griqualand East; Umtata, in Tembuland, is also a place of some note.

TRASS, a volcanic production, consisting of ashes and scoriz thrown out from the ancient Eifel volcanoes, on the Rhine, near Coblenz. It is equivalent, or nearly so, to the puzzolana of the Neapolitans, and is used as a cement. The same name is given to a coarse sort of plaster or mortar made from several other argillo-ferruginous minerals, used to line cisterns and other reservoirs of water.

TRAUTENAU, a town of Northern Bohemia, on the Aupe, in a valley of the Riesengebirge, with flax-spinning, weaving, paper-making, and other industries. Pop. (1900), 14,777.

TRAVNIK, the former capital of Bosnia, on the river Lasva, 48 miles north-west of Bosna-Serai. Pop. (1895), 6626, mostly Mohammedans.

TRENCH, RICHARD CHENEVIX, poet, scholar, and divine, was born in Dublin on Sept. 9, 1807, the son of a barrister. He was educated at Twyford, Harrow, and Trinity College, Cambridge, graduating B.A. in 1829 and proceeding M.A. in 1833. His college friends included Tennyson, Hallam, Maurice, Sterling, and Kemble. He and Kemble in 1830 accompanied the expedition of Torrijos to Spain, which had been promoted by Sterling, but they returned in time to avoid its fate. Ordained in 1832, he became curate at Hadleigh, in Suffolk, in the following year. He took priest's orders in 1835, and held the perpetual curacy of Curdridge, in Hampshire, during 1835-41. After a few years as curate at Alverstoke, in Hants, he obtained the rectory of Itchenstoke, in the same county, in 1844. He became examining chaplain to Bishop Wilberforce of Oxford in 1845, and professor of divinity in King's College, London, in the following year. The latter post was held by him till 1858, and during 1856-63 he was dean of Westminster. He was consecrated Archbishop of Dublin on the first day of 1864. He resisted the disestablishment proposals of Gladstone, but accepted the new conditions loyally. He resigned the see in 1884, and died in London on March 28, 1886. He was buried in Westminster Abbey. Trench was known as a poet by many sonnets, lyrics, and other verses published in the following, among other volumes: The Story of Justin Martyr, and other Poems (1835); Poems from Eastern Sources (1842); Genoveva (1842); Alma, and other Poems (1855). His contributions to philological subjects include: The Study of Words (1851; 22nd edn., revised by A. L. Mayhew, 1892), originally a series of lectures; On the Lessons in Proverbs (1853; 7th edn., 1888); English, Past and Present (1855; 14th edn., revised by A. L. Mayhew, 1889); and A Select Glossary of English Words (1859; 7th edn., revised by A. L. Mayhew, 1890). His Biblical and theological works comprise, amongst others, Notes on the Parables of our Lord (1841); Exposition of the Sermon on the Mount (1844); Christ the Desire of all Nations (1846); Notes on the Miracles of our Lord (1846); Synonyms of the New Testament (1854); Studies in the Gospels (1867); Brief Thoughts and Meditations (1884); and many volumes of sermons. He was a member of the committee for revising the New Testament. Among his other publications are: Sacred Latin Poetry (1849); The Remains of the late Mrs. Richard Trench (1862); Gustavus Adolphus (1865); A Household Book of English Poetry

(1868); Plutarch: his *Life, his Lives, and his Morals* (1873); and *Lectures on Mediæval Church History* (1877). See the *Letters and Memorials* (1888).

TREVELYAN, SIR GEORGE OTTO, biographer, historian, and politician, son of Sir Charles Edward Trevelyan, Bart., a distinguished Indian official, and Hannah More Macaulay, a sister of the famous Whig, was born at Rothley Temple, Leicestershire, on July 20, 1838. He was educated at Harrow and Trinity College, Cambridge, where he graduated as second classic in 1861. He was for several years in the Indian Civil Service. He sat in the House of Commons in 1865-68 as the representative of Tyne-mouth in the Liberal interest, and in 1868 he was returned by the Hawick or Border Burghs. He was appointed a civil lord of the admiralty in Gladstone's administration of 1868, but he resigned in 1870 because he disagreed with his colleagues on the Elementary Education Bill. He was prominently identified with the movement for the abolition of the purchase of army commissions, and he was a leading advocate of the electoral reforms effected in 1884-85. He accepted the post of parliamentary secretary to the admiralty in 1880, and in 1882, after the murder of Lord Frederick Cavendish and Mr. Burke, he went to Ireland as chief secretary to the lord-lieutenant. In 1884 he entered the cabinet as chancellor of the Duchy of Lancaster, and on the formation of Gladstone's short-lived ministry in 1886 he accepted office as secretary of state for Scotland. He resigned less than two months later because he could not support the Home Rule policy of the ministry, and in June of the same year, on the death of his father, he succeeded to the baronetcy. He failed to secure re-election as a Unionist after the dissolution of 1886, but in 1887 he was returned as a Gladstonian Liberal for the Bridge-ton division of Glasgow, a constituency which he represented continuously from that date till his retirement from political life early in 1897. In the Liberal government of 1892-95 he was secretary for Scotland. He is favourably known as an author by the following works: *The Competition Wallah* (1864), a series of letters on Indian matters reprinted from Macmillan's Magazine; *Cawnpore* (1865); *The Ladies in Parliament*, Horace at the University of Athens, and other Pieces (1868); *Speeches on Army Reform* (1870); *The Life and Letters of Lord Macaulay* (two vols., 1876), an admirable biography of his uncle; *The Early History of Charles James Fox* (1880), still unfinished; and *The American Revolution*, part i., 1766-1776 (1899).

TREVITHICK, RICHARD, engineer and inventor, was born at Illogan, in Cornwall, on April 13, 1771, and died at Dartford, Kent, on April 22, 1833. In 1797 he succeeded his father as a leading engineer in Cornish mining. Among his first inventions was an improved pump, which soon came into universal use in deep mining. He next perfected a high-pressure steam-engine, and began to experiment in the construction of locomotive engines. Passengers were first conveyed by steam by means of his road locomotive in 1801, and he soon after successfully worked a tram-road locomotive. His ideas were afterwards taken up and developed by Stephenson. He was the first to recognize the value of iron in ship-building, and the application of steam to agriculture. In 1816 he went out to Peru, where several engines of his devising were in use in the mines, but the outbreak of the war of independence ten years later caused him to lose all his property there. After some adventures in Central America, where he met Robert Stephenson, he returned to England in 1827. His request for recognition and reward for his numerous inventions

was disregarded by government, and during his latter years he was in great poverty. See the biography by his son Francis (London, two vols., 1872).

TRICHINIASIS, TRICHINOSIS, a painful and sometimes fatal disease produced in man by eating meat, especially the flesh of pigs, either raw or insufficiently cooked, infested with *Trichina spiralis*. See NEMATELMIA.

TRICYCLE. See CYCLE in SUPP.

TRIDENTINE COUNCIL, the Council of Trent. See TRENT.

TRIFOLIUM. See CLOVER.

TRIKKALA, chief town of a Greek nomarchy in North-west Thessaly, in the valley of the Salam-bria, 40 miles west of Larissa. Tanning, dyeing, and the manufacture of wool and cotton are carried on. It occupies the site of the ancient Trika, which had a celebrated temple of Æsculapius, but of the old town there are very few remains. Pop. (1896), 21,149.

TROUVILLE, a fashionable watering-place of Northern France, in the department of Calvados, situated at the foot of a hill on the right bank of the Touques at its mouth, near the mouth of the Seine, 10 miles south of Havre. It has a harbour, comprising an inner and an outer basin, and a splendid beach. The Casino or Salon offers all the attractions usually found in such institutions. The season is at its height in August. Pop. in 1896, 6264.

TRUJILLO, or TRUXILLO, a town of Peru, capital of the department of Libertad, near the mouth of the Rio Moche, 300 miles north-west of Lima. It stands in a sandy plain and is surrounded by walls. It is the see of a bishop, and has a cathedral, a university, an episcopal seminary, and a national college. It is connected by rail with its harbour, Salaverry. Near it are the ruins of the ancient Chimú. Pop. 8000.

TRUJILLO, or TRUXILLO, a town in Spain, in the province of Cáceres, 130 miles w.s.w. of Madrid. It consists of an old and a new town, the latter at a lower elevation and better built than the other, and it is commanded by a Moorish castle. It has some interesting churches and palaces, and there are some manufacturing industries. Francisco Pizarro and other conquistadors were born here. Pop. in 1897, 12,254.

TRUSTS AND COMBINATIONS, INDUSTRIAL. The most notable feature in the recent industrial history of the leading nations is the development of manufacturing combinations of various kinds. The main aim of all such combinations is to control prices by restricting or abolishing competition, but different methods of achieving it have been adopted. The simplest form of combination consists in an agreement to regulate prices by fixing a minimum or otherwise, and a farther step leads to the control of the output of the firms concerned. The agreement may extend to the selling of the products, and there may also be a system of equalizing profits in some measure as between the businesses which are parties to the agreement. All such combinations are known as *syndicates*, or *ring*s, or *pools* (on the Continent, *cartels*). The insufficiency of these methods to attain the object in view has led to the development of the *trust*, which differs from the syndicate in being an actual fusion of competing businesses. The pioneer body of this kind was the Standard Oil Trust, formed in the United States in 1882, an amalgamation of numerous companies under a board of trustees, who received the stock of the constituent bodies and gave certificates in return, thus acquiring entire control of the united firms. This method was declared illegal in 1892, and accordingly different plans have been adopted with

the same practical effect. A new company is formed to buy out the plants of the combining companies, or at least to acquire a controlling share in their stocks, and the vendors receive shares of the new company in payment of a large part of the purchase-money. Sometimes the vendors hold jointly all the shares of the combine, and in every case they own sufficient to control it effectually. Such combinations or trusts have been formed chiefly in the United States, Great Britain, and Germany. Some of them are amalgamations of all or most of the manufacturers in a particular branch of business, whilst others are combinations of those concerned in the series of connected industries, beginning with the extraction of a raw material and ending in the sale of the finished product. The United States Steel Corporation, formed in 1901 by the amalgamation of ten smaller trusts, has a nominal capital of 1,404,000,000 dollars. It has a controlling interest in railways, lake steamers, and docks, and it owns practically all the stocks of the constituent trusts. It is claimed in favour of trusts that they lead to many economies in production and distribution, and lead to improved industrial organization; but, on the other hand, it cannot be doubted that they may become a serious political danger, and that their influence may be very pernicious in other directions. The dangers of trusts have been specially exemplified in the United States. See Lloyd's Wealth against Commonwealth; Jenks's The Trust Problem; Jeans's Trusts, Pools, and Corners; and Macrosty's Trusts and the State.

**TSARITSYN**, or **ZARITZIN**, a town of European Russia, in the extreme south of the government of Saratov, on a bend of the river Volga, about 230 miles north-west of Astrakhan. It is an important railway centre, and carries on a large trade by rail and river in grain, fish, naphtha, cotton, salt, and metals. (See *VOLGA*.) It also contains numerous manufacturing establishments. Pop. (1897), 55,967.

**TUAMOTU ISLANDS**, **PAUMOTU**, or **LOW ARCHIPELAGO**, a group of about eighty islands in the Pacific, lying eastwards from the Society Islands and south of the Marquesas. About sixty of the islands are inhabited, but none of them are specially fertile. They are mostly under French protection, and have a population of about 5500. They export pearls, mother-of-pearl, trepang, &c.

**TUBERCULOSIS**, in medicine, the name applied to a disease which takes several forms, and is due to the formation of *tubercles*, these again being due to a germ known as the *tubercle bacillus*, which has gained admission to the system. A tubercle is a little nodule, gray in colour, about the size of a millet seed, and consisting of a collection of round cells. The little nodule tends to increase in size by the growth of others round it, and by its growth it destroys the substance of the part in which it has arisen, occasioning also inflammation in the surrounding parts. It has no great vitality, and undergoes changes which begin in the centre of the nodule, the result being to convert the firm gray mass into yellow cheesy material. The process may go on until the nodule becomes quite broken down into soft matter, and if the matter can break out from the part an ulcer is left. Instead of softening, the nodule may become hard by the deposit of lime-salts in it, and may thus become converted into a little solid mass in the substance of the tissue where it is lodged. The effects produced by the formation of such tubercles depend on the organ or tissue of the body in which the diseased process is going on. In the general disease tuberculosis the formation of the gray nodules proceeds in most of the organs of the body—lungs, liver, kidneys, lymphatic glands,

bowels, membranes of the brain, &c., and the symptoms produced are those of fever, strongly resembling those of typhoid. This form of the disease may last two or three weeks, and its termination is death. The true nature of the disease it is extremely difficult to recognize during life. On the other hand, the formation of tubercles may be limited to one organ of the body, at least at first. Thus, if the formation is principally in the lungs it produces consumption or phthisis. In the bowels it produces consumption of the bowels. A similar tubercular deposit in lymphatic glands is believed to produce the main features of scrofula. That tubercle spreads by contagion there is now no doubt, and the former belief that consumption was hereditary is now discredited, though an inherited predisposition towards it is believed in by many. The spit of affected persons is regarded as one common medium by which the disease is spread. Besides being a disease of man, tuberculosis attacks animals, and especially cattle, and less frequently swine. The name of the German scientist Koch is well known in connection with tuberculosis, and his *tuberculin*, prepared from the bacilli, has been alleged to have curative virtues when employed in combating the disease. (See *GERM THEORY IN SUPP.*; also *CONSUMPTION*.)

**TUBUAI** or **AUSTRAL ISLANDS**, a group in the Pacific Ocean, south of the Society Islands, and, like them, under France. They are fairly fertile, and produce tobacco, bananas, and arrow-root, but the bread-fruit tree will not grow on them, and the cocoa-palm is rare. Area, about 100 square miles; pop. about 900.

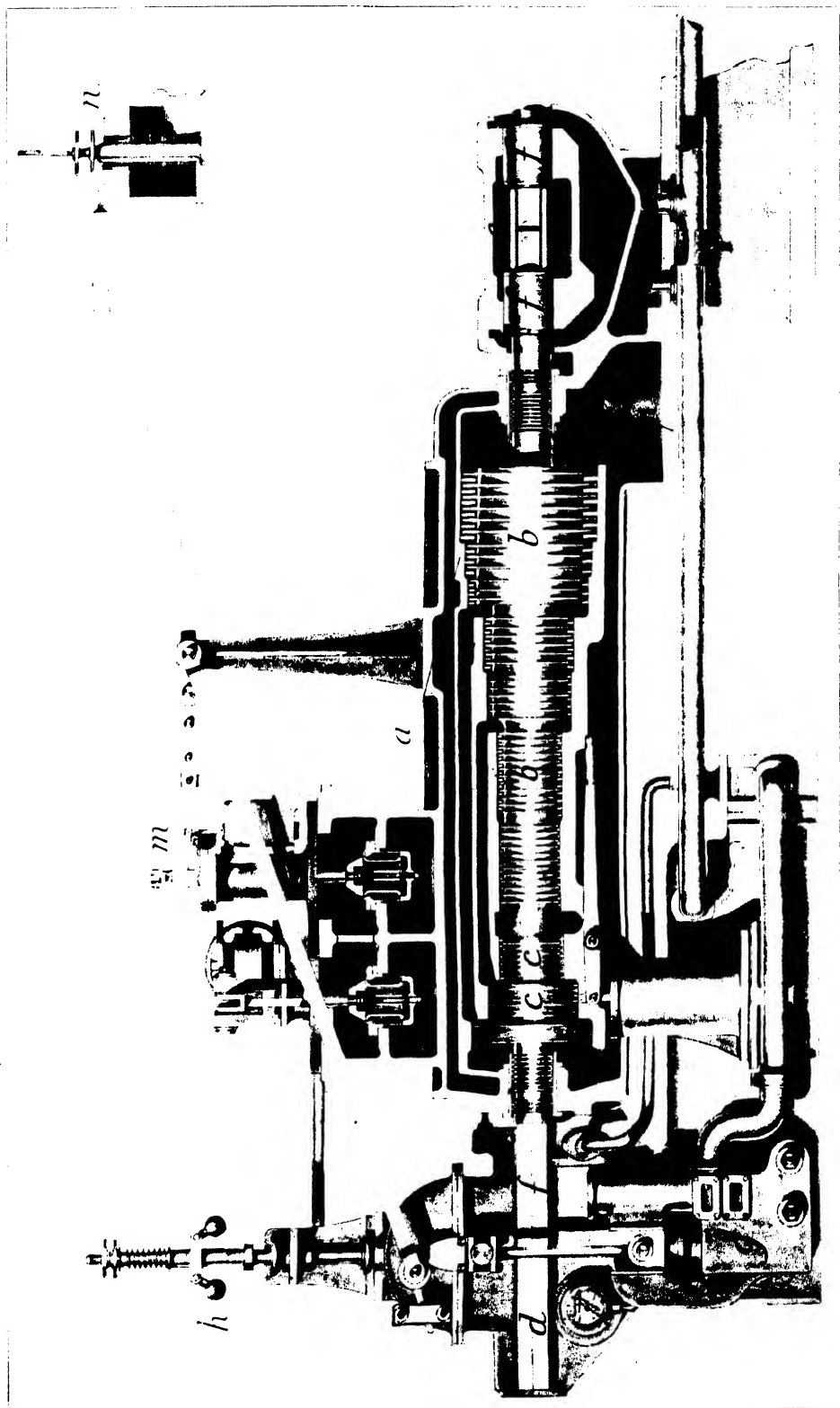
**TUCSON**, a town of the United States, capital of Pima county, Arizona, on the Santa Cruz river. Among the chief buildings are the University of Arizona, public high-school, public library, and banks. The inhabitants are chiefly engaged in mining and stock-rearing, and there is a trade with Mexico. Pop. (1900), 7531.

**TUCUM** (*Astrocaryum vulgare*), a Brazilian species of palm, yielding a fine durable fibre of which thread, cordage, bow-strings, &c., are made; and also an oil which is known by the same name.

**TUIA-METAL**, an alloy of silver, with small proportions of lead and copper, forming the base of the celebrated Russian snuff-boxes popularly called platinum boxes.

**TULLOCH**, JOHN, D.D., theologian, was born on June 1, 1823, at Bridge of Earn, Perthshire, and educated at St. Andrews and Edinburgh Universities. Having been licensed as a preacher in the Church of Scotland he was ordained, in 1845, to a charge in Dundee. In 1847 he spent some time in Germany, and in 1849 became minister of the parish of Kettins in Forfarshire. About this time he became known as a writer in the *British Quarterly Review*, the *North British Review*, and other periodicals, and an article in the latter on Bunsen's Hippolytus led to his appointment as principal and primarius professor of theology in St. Mary's College, St. Andrews, in 1854. He became still better known as the winner of the second of the Burnett prizes (£600) by an essay which was afterwards published under the title of *Theism* (1855). Other works were: *Leaders of the Reformation* (1859); *English Puritanism and its Leaders* (1861); *Beginning Life* (1862); *Rational Theology and Christian Philosophy in the Seventeenth Century* (two vols., 1872); *Facts of Religion and Life* (1877); *Pascal* (1878); *Modern Theories in Philosophy and Religion* (1884); and *Movements of Religious Thought in Britain during the Nineteenth Century* (1885). He was a constant contributor to magazines, had some share in founding the *Contemporary Review*, and was editor for

### STEAM TURBINE.—I.







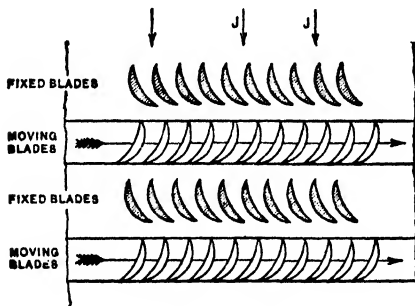
some time of Fraser's Magazine. He held the position of Principal of St. Andrew's University at his death in February, 1886. He was one of the most influential men in the Scottish church.

**TULTCHA**, or **TULCEA**, a town of Roumania, in the Dobrudja, 50 miles south-east of Galatz, on the Danube, which near it divides into its three chief mouths. It has a good trade. Pop. 18,000.

**TUNGUSES**, the general name of the Manchu tribes which occupy Eastern Siberia from the Yenisei to the Pacific coast. They are mainly nomads, but a considerable portion now engage in the systematic cultivation of the land. Hunting and fishing are among their principal occupations. They live in tents of skin or bark, and have no towns or villages. All travellers speak highly of their mental and moral qualities. They are intelligent, possessed of considerable taste, with keen senses, and of a peaceable and sociable disposition. In religion they are mostly Shamanist, pagan, or Buddhist, but a few are Christians. They number in all about 50,000. See **ETHNOLOGY**.

**TUNKERS**. See **DUNKERS** in SUPP.

**TURBINES, STEAM**. Turbines driven by steam instead of water are of very ancient date. In fact the first was made by Hero of Alexandria about 200 B.C., but owing to the practical difficulties in economically utilizing the very high velocities of steam jets they did not come into practical use until the invention in 1884 of the compound parallel-flow steam turbine by the Hon. Charles A. Parsons, F.R.S. In this the expansion of the steam is carried out in a series of turbines, thus getting moderate velocities and enabling its power to be fully utilized. Another type of turbine is the *Laval*, invented in 1889, in which a disc driven by steam at very high velocity is geared down by spiral gearing to moderate speeds of revolution. Plate I. shows a section of the Parsons compound steam



turbine as applied to driving dynamos. The turbine motor consists of a cylindrical case, *a a*, with rings of inwardly-projecting blades. Within and concentric to this revolves a shaft, *b b*, with rings of outwardly-projecting blades. The rings of blades on the case nearly touch the shaft, and the rings of blades on the shaft lie between those on the case, which they nearly touch. The figure adjoining shows a form of blades which is used. Steam entering at *J* passes first through a ring of fixed guide-blades, and is projected in a rotational direction upon the succeeding ring of moving blades, imparting to them a rotational force; it is then thrown back upon the succeeding ring of guide-blades, and the reaction increases the rotational force. The same process takes place at each of the successive rings of guide and moving blades. The energy to give the steam its high rotational velocity at each successive ring is supplied by the drop in pressure,

and the steam expands gradually by small increments. At the left side of the spindle (see plate) are grooved pistons or dummies, *c c*, which fit into corresponding grooves in the cylinder. The object of the dummies is to prevent end-thrust, and there is therefore a passage in the cylinder between each diameter of the spindle and the dummy of the same size. The dummies also act as a practically steam-tight joint, since the clearance between the grooves can be adjusted longitudinally by a thrust-block in the end oil-keep *d*. The bearings, *f f*, are of the tubular pattern, and owing to the light weight of the revolving spindle the wear is so small that the bearings often run for several years without being touched. The armature is directly coupled to the motor spindle by means of a steel sleeve or flexible clutch coupling *e*.

Oil is circulated through the bearings by the oil-pump *g*, which is driven by a worm-wheel in the keep *d*. This worm-wheel also actuates the governor *h*, which is connected to the valve *k*. This is a governor intended to come into action only if the speed is excessive. The governing of the turbine is effected by the valve *l*. The position of this valve is regulated by the smaller valve *m* through a relay, which in turn is moved by the lever *m n*. At the end *n* of this lever is either a centrifugal governor, if it is desired to keep the speed constant, or if, as in the plate, it is desired to keep the voltage constant, there is a core dipping into a solenoid, which is in shunt across the terminals of the dynamo. An adjustable spring counteracts the force due to the magnetic pull of the solenoid. The steam enters from the stop-valve through the emergency valve *k*, then through the governor valve *l* to the turbine, through which it passes, giving up its work, as it gradually expands, to the exhaust *p*.

Plate II., fig. 1, shows a 500 kilo-watt turbo-alternator for 2000 volts at 80 periods running at 2400 revolutions per minute, and fig. 2 on the same plate is an illustration of two turbo-alternators, each of 1250 kilo-watts, for 4000 volts at 50 periods running at 1500 revolutions per minute. With about 130 lbs. steam pressure, and a superheat of about 50° Fahr., the former gives a consumption of 21 lbs. of steam per kilo-watt hour when exhausting into a condenser, and the latter a consumption of 19½ lbs. per kilo-watt hour, which is equivalent to about 11½ lbs. per indicated horse-power hour. These results are equal to, or better than, the very best triple-expansion engines. Turbines up to 3000 kilo-watts are under construction, and still larger sizes are in contemplation.

The steam turbine has also been applied to driving fans for the ventilation of collieries, as shown on Plate II., fig. 3, and also for centrifugal pumps, air-compressors, and many other purposes. The absence of all reciprocating parts in steam turbines prevents all vibration, and very small foundations and no holding-down bolts, are required. The even turning movement and the small space, attendance, and upkeep required have made the steam turbine very largely adopted as a prime motor.

One of the most important fields for the steam turbine is the propulsion of ships, where the increasing size and speed of the engines call for some motor without reciprocating parts. The first vessel fitted with these engines was the *Turbinia*, of 44 tons displacement, 100 feet long, 9 feet beam, and 3 feet draught of hull. She was fitted with turbine engines of 2500 horse-power, and reached the unprecedented speed of 34½ knots. Torpedo-boat destroyers have also been fitted with these engines, and have reached 12,000 horse-power and 37 knots speed, instead of 6000 horse-power and 31 knots

as in the case of ordinary engines on the same displacement. On the Clyde the *King Edward*, 250 feet long and 30 feet beam, has been fitted with engines of 3500 indicated horse-power. Two of her engines are shown in Plate III. These consist of three turbines, each driving a separate shaft, the wing shafts having two propellers and the centre shaft only one. Steam is admitted to the centre turbine, which is the high-pressure, and thence exhausts through the low-pressure turbines on each side into the condensers. For reversing, the low-pressure turbines are fitted with a reversing turbine in the same case. The vessel's speed on trial was 20½ knots, and during the season's trial it was found that the coal consumption was under 1·8 lb. per indicated horse-power hour. A comparison made between her and another passenger steamer on the Clyde, the *Duchess of Hamilton*, which has the same dimensions as the *King Edward*, has shown that although in regular service the *King Edward* steamed 18½ knots as against 16½ knots in the case of the *Duchess of Hamilton*, the coal consumption per mile was about 3 per cent less. It would naturally be expected from her higher speed that the *King Edward* would consume more, but the reverse is the case. Another boat, the *Queen Alexandra*, has also been built, and is of somewhat larger size and of higher speed than the *King Edward*. Several cross-channel steamers and yachts are now being engined with steam turbines, and others of larger size for Atlantic liners are in contemplation, for which purposes the absence of vibration, light weight, and small coal consumption make them especially fitted.

**TURKS ISLANDS**, comprising Grand Turk and Salt Cay, belong geographically to the Bahamas, and with the Caicos Islands are a dependency of Jamaica, having a government of their own. Grand Turk is 7 miles long and 2 broad; pop. (1901), 1751. Salt Cay is smaller; pop. 485. Pop. of Turks and Caicos Islands in 1901, 5287. The chief export is salt. See CAICOS.

**TURNER, CHARLES TENNYSON**. See under TENNYSON in SUPP.

**TURPENTINE-TREE**, the name given to some species of trees of the genus *Pistacia*, belonging to the natural order Anacardiaceæ, which yield turpentine, as the *P. terebinthus*, the Chian or Cyprus turpentine-tree, *P. lentiscus*, the Mount Atlas mastic or turpentine-tree, &c. See PISTACHIO.

**TURPETH**, the root of *Convolvulus* or *Ipomœa Turpethum*, a plant of India, Ceylon, and Australia, possessing purgative properties, and also known as Indian jalap. *Mineral turpeth*, a sulphate of mercury, is a powerful emetic, and is used as an erethic.

**TURTON**, a town of England, in Lancashire, 4 miles north of Bolton, with cotton-mills, print-works, quarries, &c. Pop. (1891), 11,808; (1901), 12,353.

**TUTICORIN**, a seaport of India, in Tinneveli district, Madras, on the west coast of the Gulf of Manaar, a terminus of the South Indian Railway. The roadstead is good and the trade considerable. The exports are mainly cotton, coffee, jaggery, chillies, &c., and rice, cattle, horses, sheep, and poultry are sent to Ceylon. There are pearl and conch fisheries. Pop. (1891), 25,107; (1901), 28,048.

**TUTTILINGEN**, a town of Württemberg, on the Danube, here crossed by a bridge, near the Baden frontier. It has manufactures of boots and shoes, surgical instruments, cutlery, leather, &c. Pop. (1900), 13,539.

**TUTUILA**, the third largest of the Samoan or Navigators' Islands, belonging to the United States, to the south-east of Upolu. of a wild and pictur-

esque character. It is about 18 miles long by 5 broad. It rises about 2000 feet above the sea, is covered with vegetation, and has several good harbours. Pop. about 3800.

**TWAIN, MARK**. See CLEMENS, SAMUEL LANGHORNE, in SUPP.

**TWAT**, an oasis group in the Sahara, situated to the south of Algeria, on the trade with which it is very dependent. There are five groups, the whole forming politically a loose confederation of some three hundred small states. The soil is fertile, and yields dates, opium, tobacco, cotton, henna, fruits, cereals, and vegetables. In Salah in the south is an important trade centre. The inhabitants are fully 120,000 in number, partly Arabs, partly Berbers, with a strong negro element, and are fanatical Mohammedans.

**TWICKENHAM**, a town of Middlesex, England, on the Thames, nearly 11 miles south-west of London, 3 miles north-west of Kingston, and connected with Richmond by a bridge. In the eighteenth century it was a fashionable resort, and the residence of Pope, Horace Walpole, and other notables. It contains a town-hall (with free library), a museum, an orphanage, &c. Pop. (1891), 16,027; (1901), 20,991.

**TYLDESLEY**, a town of England, in Lancashire, 10 miles west by north of Manchester, with churches and chapels, public baths, a cemetery, &c. It has cotton-mills and collieries. With Shakerley it forms an urban district. Pop. in 1891, 12,891; in 1901, 14,843.

**TYLOR, EDWARD BURNETT**, anthropologist, was born in London on Oct. 2, 1832, and educated at a Quaker school in Tottenham. He spent some years in travel in Central America and the West Indies, and in 1861 he published his first work under the title *Anahuac*, or Mexico and the Mexicans. Four years later appeared his important *Researches into the Early History of Mankind and the Development of Civilization*, and in 1871 he published his well-known treatise on *Primitive Culture: Researches into the Development of Mythology, Philosophy, Religion, Art, and Custom* (3rd edition, 1891). Another standard work from his pen is *Anthropology: an Introduction to the Study of Man and Civilization* (1881). In 1883 he was appointed keeper of the Oxford University Museum and reader in anthropology, and in 1895 he became professor of anthropology there. He was Gifford lecturer at Aberdeen in 1888, and holds the degrees of D.C.L., Oxon. (1875), and LL.D., St. Andrews (1878). In 1900 he published a work on *The Natural History of Religion*.

**TYRRELL, ROBERT YELVERTON**, classical scholar, son of a clergyman, was born at Ballingarry, in the county of Tipperary, on Jan. 21, 1844. He was educated at a private school and at Trinity College, Dublin, graduating with honours in classics and philosophy. In 1868 he was elected a fellow of Trinity College, in 1871 he became professor of Latin there, and during 1880-98 he held the regius professorship of Greek. He was senior tutor and public orator in 1899. He has published editions of plays by Euripides and Plautus, has translated the *Acharnians* of Aristophanes into English verse (1883), has edited the *Correspondence of Cicero* in seven volumes (1879-1900; the last five in collaboration with Dr. Purser), one of the most important works in Latin scholarship brought out during the nineteenth century; and has also produced the following works: *Cicero in his Letters* (2nd ed., 1896); *Latin Poetry* (1895), a course of lectures delivered in Johns Hopkins University; *Sophocles* (1897); and an *Anthology of Latin Poetry* (1901), from the

earliest times to Boëthius; while he has also contributed to periodical literature. He has had several honorary degrees conferred upon him, and in 1902 he was appointed an original member of the British Academy for the Promotion of Historical, Philological, and Philological Studies.

## U.

**UBANGI.** See **MOBANGI** in **SUPP.**

**UDAIPUR**, or **ODDEYPORE**, a town in the north-west of India, capital of a native state of the same name in Rajputana, 70 miles west of Gwalior. It is finely situated beside a lake 2000 feet above sea-level, contains a notable royal palace, and exports cotton, indigo, &c. Pop. (1891), 46,693; (1901), 45,976. —The state (called also **MEWAR**), with an area of 12,670 square miles, came under the protection of Britain in 1817, and the rajah ranks highest in dignity among the Rajput chiefs. Pop. (1891), 1,728,049; (1901), 1,021,664.

**UDDEVALLA**, a seaport in the south-west of Sweden, in the province of Göteborg, at the inner end of the Byfjord, 50 miles north of Göteborg, with a museum of antiquities, a cotton-mill, and considerable trade. Pop. (1900), 9442.

**UDDINGSTON**, a town of Scotland, in Lanarkshire, some 5 miles east by south of Glasgow, on the Clyde. Many people who have their business in Glasgow reside here, and there are works for agricultural implements, &c. Pop. (1891), 5099; (1901), 7463.

**UITENHAGE**, a town of Cape Colony, situated in the valley of the Zwartkops river, 21 miles north-west of Port Elizabeth, with which it is connected by rail. The streets are well laid out and planted with trees, and streams traverse many of them. The town contains botanical gardens, a fine town-hall, public offices and court-house, several good educational institutions, various churches, a public library, &c. The chief industrial establishments are wool-washing works and railway workshops, and in the neighbourhood are extensive nurseries and vineyards. Pop. (1891), 5331.

**UJJI**, a town of German East Africa, on the east shore of Lake Tanganyika, a short distance to the north of the mouth of the Malagarazi river, in a very unhealthy region. It is a residence of Arab traders, and a halting-place for caravans. It was here that Stanley first met Livingstone. Pop. 8000.

**ULEÄBORG**, a town of Russia, in the Grand-duchy of Finland, capital of a government of the same name, at the mouth of the Uleå, on the north-east shore of the Gulf of Bothnia. It has some manufactures, and carries on a trade in timber, butter, grain, &c. A railway line connects it with Helsingfors and the other chief towns of Finland. Pop. (1899), 15,626.

**UMTALI**, a town of Southern Rhodesia, near the frontier of Portuguese East Africa, 172 miles by rail south-east of Salisbury. The old township was laid out in 1892, but New Umtali, 10 miles to the east, came into being with the Beira-Salisbury railway. Its site is healthy, and it already contains government offices, hotels, boarding-houses, a park and athletic grounds, a church, a hospital, a telephone exchange, a post-office, and a tramway. Gold is found in the neighbourhood. Pop. includes 550 whites; total of district, 2000.

**UNGAVA**, a district of the Dominion of Canada, formed in 1895, in the Labrador peninsula, bounded on the north by Hudson Strait, west by Hudson Bay and James Bay, south by Quebec, and east by

the Atlantic. Ungava Bay, in the north of the district, opens into Hudson Strait.

**UNION ISLANDS.** See **TOKELAU** in **SUPP.**

**UNIVERSITY EXTENSION**, a movement in Britain to extend the means of higher education to persons of all classes and of both sexes engaged in the regular occupations of life. Any community may avail itself of the privileges and become a university extension centre by forming a local committee, who provide the necessary funds and fix fees, &c. The mode of instruction consists of courses of lectures by specialist graduates of the universities, who are appointed by delegates elected by each university to undertake the management of the extension scheme. Each lecture is preceded or followed by a class, in which the students are orally examined by the lecturer, who also corrects written papers done at home. An examination is held at the end of each course, and certificates awarded. The movement began in 1872 with Cambridge University, but Oxford did not go heartily into it till 1885. The London Society for the Extension of University teaching within the Metropolitan Area was formed in 1876. Durham University is associated in the work with Cambridge, and the Scotch universities have made less successful experiments in various parts of the country. Besides a large number of ordinary centres there are also in connection with Cambridge University seven *affiliated centres*. Students in connection with these have the privilege of entering the university without passing the 'little go' examination, and may proceed to the degree examination a year sooner than they otherwise would; but of course they have to pass through a settled course of study, and must give evidence of satisfactory proficiency in Latin, one other language, and mathematics. Both at Oxford and Cambridge arrangements have been made with a number of county councils, by which courses of lectures in science, agriculture, &c., are given by university lecturers at numerous towns and villages. Summer meetings are also held at Oxford and Cambridge, at which large numbers of students attend on lectures. Home reading circles under the direction of leaders are also an outcome of the movement, which is extending rapidly.

**UNNA**, a town of Prussia, in the province of Westphalia, 10 miles to the east of Dortmund. It contains a fine town church, iron-foundries, machine-works, chemical-works, &c., and near it there are hot baths. Pop. (1900), 14,918.

**UNYORO.** See **UGANDA**.

**UPHOLLAND**, a town of England, in Lancashire, 4 miles east of Wigan, with an ancient church (restored), other places of worship, a Catholic college, a seventeenth-century grammar-school (reorganized), collieries, quarries, brick-works, &c. There are remains of a Benedictine priory. Pop. (1891), 4442; (1901), 4773.

**UPOLU**, the second largest and the most important of the Samoan group of islands in the South Pacific, belonging to Germany. It is about 150 miles in circumference, and cotton and cocoa-nut oil are its principal products. It is traversed by a

range of mountains about 2000 feet high, and presents splendid forest scenery. Apia is the capital, and the only town in the archipelago. Pop. about 15,500.

**URÆMIA**, a diseased condition of the body arising from the presence of urea in the blood, in consequence of the urine not being properly secreted, as in Bright's disease or other ailments, thus leaving in the blood elements that should be carried off. The symptoms of uræmia are headache, mistiness of vision, noises in the ears, oppression, dulness, drowsiness, sometimes delirium and convulsions, and it ends in coma and death. It is a most serious disease, and no time should be lost in securing the services of a responsible physician.

**URE, ANDREW**, chemist and technologist, was born at Glasgow on May 18, 1778, and died in London, Jan. 2, 1857. He was educated partly at Glasgow and partly at Edinburgh University, and graduated as M.D. at the former in 1801. In 1804 he obtained the appointment of professor of chemistry and natural philosophy in the Andersonian Institution in his native city. Having taken an active part in promoting the erection of the observatory at Glasgow in 1809, he was appointed its first astronomer. In 1813 appeared his first literary production, *A Systematic Table of the Materia Medica*, and in 1818 he gained considerable reputation by a memoir which he read before the Royal Society, entitled *New Experimental Researches on some of the leading Doctrines of Caloric*. In 1821 he published a *Dictionary of Chemistry* (two vols.), which was long the undisputed standard work on the subject. In 1830 he removed to London, and in 1834 he was appointed analytical chemist to the board of customs. In 1835 he published his *Philosophy of Manufactures*; in 1836, *The Cotton Manufacture of Great Britain*; and in 1837-39 the first edition of his *Dictionary of Arts and Manufactures* (two vols.), afterwards rewritten and enlarged by Robert Hunt.

**URFA**, a town of Turkey in Asia, in Upper Mesopotamia, vilayet Aleppo, seat of an Armenian bishop, and of a French and an American mission. There are some relics of ancient and mediæval times. Some manufacturing and trade are carried on. Pop. about 55,000.

**URGA**, or **BOGDO-KUREN**, a town in Northern Mongolia, on the Tola, at an elevation of 4370 feet above sea-level. It contains several large Buddhist monasteries, occupied by about ten thousand monks, and is a sacred city of the Buddhists, the seat of a high priest or lama. With the exception of the monasteries and temples the town is extremely dirty

and ill-built. It is the seat of the Chinese administration of Northern Mongolia, and there is a separate Chinese quarter. It is also a considerable trading centre, lying as it does on the highway between Kiachta and Peking. Estimated pop. 30,000 to 40,000, part of whom are nomadic.

**URMSTON**, an urban district of England, in Lancashire, 5 miles south-west of Manchester, with modern churches and chapels, &c. Pop. (1891), 4042; (1901), 6591.

**URODELA**. See **AMPHIBIA**.

**URUMTSI**, a city of Central Asia, in Chinese Zungaria (province Sin-kiang), on the northern side of the Thian-Shan Mountains. It consists of an old and a new town, the former being situated on the slope of a mountain which attains a height of 14,000 feet above sea-level. It was formerly of great commercial importance in the trade between Russia, Turkestan, and India. Urumtsi is of strategic importance and is now the administrative and military capital of the province of Sin-kiang. Pop. estimated at 15,000.

**USHKUP**, **USKUB**, or **SKOPIA**, a town of North-western Turkey, in the vilayet of Kossovo, on the river Vardar, seat of a Greek archbishop, with manufactures of leather, metals, cloth, &c., and dye-works and other industrial establishments. Much fruit is grown in the neighbourhood, and there is a trade, carried on through Salonica, in grain, cattle, fruit, opium, skins, wool, &c. Several important highways converge here, and the place has increased rapidly since the railway from Salonica to Servia, &c., reached it, and another line branching off here was constructed. Pop. about 40,000.

**USK**, an urban district and parliamentary borough in Monmouthshire, on the river Usk, 12 miles south-west of Monmouth. It unites with Monmouth and Newport in sending one member to parliament. There are ruins of an old castle. Wood-turning and chair-making are the chief industries. Pop. of urban district in 1891, 1449; in 1901, 1476.—The Usk river rises on the border of Carmarthen-shire and Brecknockshire, flows east and south-east for 57 miles to the Bristol Channel, 4 miles south of Newport. The scenery of its course is very beautiful, and it gives excellent salmon-fishing.

**UTAKAMAND**. See **OOTACAMUND**.

**UTICA**, an ancient city of North Africa, near the mouth of the river Bagrada. After the destruction of Carthage, Utica became the capital of the Roman province. It was destroyed by the Arabs in the latter part of the seventh century.

## V.

**VALDIVIA**, a town of Chili, capital of the province of the same name, on the river Cruces, 12 miles distant from the port of Corral, 200 miles south of Concepcion. It is an active industrial city, with distilleries and breweries, many tanneries, &c., its prosperity being due to the numerous Germans settled here. Vessels drawing 11 feet can reach Valdivia at high spring-tides. Large steamers call at Corral. It exports leather, wheat, oats, honey, &c., the foreign exports going mostly to Germany. Pop. (1900), 9819.

**VALENCIA**, a flourishing agricultural city of Venezuela, near the west end of Lake Valencia or Tacarigua, about 90 miles west by south of Caracas, with which it is connected by rail. It is well

built, with broad streets, and has a large market-place, a fine cathedral, and a college. Pop. 39,000.

**VALLEJO**, a city and seaport of Solano county, California, on an arm of San Pablo Bay, 26 miles north-east of San Francisco. It has a spacious harbour, flour-mills, ship-yards, terra-cotta works, iron-foundries, and machine-shops. Large quantities of grain are shipped. Pop. (1900), 7965.

**VALVE**, a kind of movable lid or cover adapted to the orifice of some tube or passage, and so formed as to open communication in one direction and to close it in the other. It is used to regulate the admission or escape of a fluid, such as water, gas, or steam. Some valves are self-acting, that is, they are so contrived as to open in the required direction

by the pressure of the fluid upon their surface, and immediately to shut and prevent the return of the fluid when the direction of its pressure changes. Others are actuated by independent external agency. Examples of the former kind are presented in the valves of pumps, and in the safety-valves of steam-boilers; and of the latter in the slide-valves appended to the cylinder of a steam-engine for the purpose of regulating the admission and escape of the steam. The construction of valves admits of an almost endless variety. They may be classified as *rotary*, as in throttle-valves; *lifting*, as in the safety-valve and the ball-valve; *hinged*, as in the butterfly-valve; *sliding*, as in the slide-valve; *spring*, as in some safety-valves; *inverted-cup*; *key*, as those of the flute and other musical instruments. See PUMP, STEAM-ENGINE, &c.

VAMBÉRY, ARMINIUS, Hungarian traveller and scholar, was born at Szerdahely on March 19, 1832. He studied at Pressburg, Vienna, and Budapest, and then went to Constantinople, where he lived by teaching French. In 1858 he published a German-Turkish dictionary. In 1861-64, disguised as a dervish, he undertook an extensive journey of exploration through Persia into Turkestan, and visited Khiva, Bokhara, and Samarcand. In 1865 he became professor of oriental languages at the University of Budapest, and he has written many valuable linguistic works as well as works on his travels, including *Travels in Central Asia* (1864); *Wanderings and Adventures in Persia* (1867); *Sketches of Central Asia* (1868); *History of Bokhara* (1873); *Central Asia and Anglo-Russian Frontier* (1874); *Islam in the Nineteenth Century* (1875); *Etymological Dictionary of the Turco-Tatar Languages* (1878); *Primitive Civilization of the Turco-Tatar Peoples* (1879); *The Origin of the Magyars* (1882); *The Coming Struggle for India* (1885); *The Turkish People* (1885); *Story of Hungary* (1887); &c. The *Story of his Life and Adventures* appeared in 1888. He has also been a frequent contributor to periodical literature in England, Germany, and Hungary.

VANCOUVER, a city of Canada, in British Columbia, at the western terminus of the Canadian Pacific Railway, on Burrard Inlet, near the Strait of Georgia. It is well laid out, has numerous good buildings, with electric street-railways, electric light, gas, water-works, and other equipments hardly to be expected in a town that has grown up since 1885. There are extensive wharves, and a large trade in lumber. Fishing is also an important occupation. The most interesting feature of Vancouver is Stanley Park, a public pleasure-ground 940 acres in extent, consisting of a portion of the primeval forest intersected with walks and surrounded by a 10-mile drive. This park contains some of the gigantic Douglas firs belonging to the forest that formerly covered the site of the town. An electric railway connects the town with New Westminster. Pop. (1891), 13,709; (1901), 26,133.

VANCOUVER, GEORGE, English navigator, was born in 1758, and died at Petersham on May 10, 1798. He entered the navy as able seaman in 1771; accompanied Cook on his second and third voyages (1772-74 and 1776-79); was made first lieutenant in 1780; and served in the West Indies until 1789. In 1790 he was put in command of a small squadron sent to take over Nootka from the Spaniards, and was also charged to ascertain if there was a north-west passage. He sailed in the *Discovery*, April 1, 1791, spent some time at the Cape, and afterwards made for Australia and New Zealand, the coast of which he surveyed. He then went north and received formal surrender of Nootka, and spent the

three summers of 1792-94 in surveying the American coast as far north as Cook's Inlet, wintering at the Sandwich Islands. On his return voyage he visited the chief Spanish settlements on the west coast of South America, and reached England in 1795. In 1798, shortly after his death, an account of this voyage was published, with the title, *A Voyage of Discovery to the North Pacific Ocean and round the World in the years 1790-1795* (three vols., with plates).

VANUA LEVU. See FIJI.

VARASDIN, a royal free town of Austria-Hungary, capital of a county of the same name in Croatia, on the Drave, here crossed by a wooden bridge, 70 miles south-east of Gratz. It has an old castle, several Roman Catholic churches and convents, a synagogue, a fine county-house, a high-school, and manufactures of tobacco, liqueurs, vinegar, and silk wares. Pop. (1900), 12,930.

VASELINE, a useful product obtained by an elaborate system of filtration from crude petroleum. It is a pale-yellow, translucent, slightly fluorescent semi-solid, insoluble in water, slightly so in alcohol, freely in ether, and may be mixed in any proportion with fixed and volatile oils. This substance, of American introduction, has since 1876 become of considerable importance, having been found an excellent substitute for lard in the preparation of ointments—its quality of never getting rancid giving it a decided value in all medical preparations over the animal fats—and it seems to furnish a good basis for soaps, pomades, cold-creams, &c., thus disputing the virtues of glycerine as an emollient. Taken internally it is said to be of efficiency in the cure of coughs, colds, hoarseness, and irritation of the throat. It is extensively used in hospitals as a remedy for burns and scalds, to prevent pitting in small-pox, and for every kind of skin disease, inflammation, and irritation. Applied to the surface of steel, it is found to be highly useful in preventing the attacks of rust.

VEDDAS, VEDDAHS. See CEYLON.

VENLO, a town of the Netherlands, in the province of Limburg, on the right bank of the Meuse. It is on several railway lines, has a fine town-house, and breweries, distilleries, tobacco-works, tanneries, &c. The fortifications of the town were levelled in 1868. Pop. (1895), 12,154.

VENOSA (anc. *Venusia*), a town of Italy, in the province of Potenza, 23 miles north of the city of that name. It has a cathedral, and a castle dating from the fifteenth century. Horace was born here. Pop. 8000.

VENTIMIGLIA (French, *Vintimille*), a town of northern Italy, in the province of Porto Maurizio, 7 miles east of Mentone. It is a bishop's see, and is surrounded by forts. There is an interesting church, and a town-house containing a collection of Roman antiquities. Pop. 5000.

VERATRIN, or VERATRIA ( $C_{27}H_{45}NO_6$ ), a vegetable alkaloid found in species of *Veratrum*, and along with *sabadillin* in *sabadilla* or *cevadilla*, the seeds of the liliaceous plant *Schemocaulon officinale*. (See *SABADILLA*.) It is generally obtained as a crystalline powder, nearly white, very acrid and poisonous, insoluble in water, but very soluble in alcohol. In the form of tincture, and still more in that of ointment, veratrin is much used as an external application in cases of neuralgia and obstinate rheumatic pains. The smallest quantity entering the nose causes violent and even dangerous sneezing.

VERATRUM, a well-known genus of liliaceous plants. *Veratrum album* (white hellebore) is a native of most alpine meadows in the southern, central, and northern parts of Europe. It yields

the substance veratrin (which see). Every part is acrid and poisonous, especially the rhizomes. A powder prepared from it is used to destroy caterpillars in gardens. The *V. viride* of North America (American hellebore) is an acrid emetic, and acts strongly in lowering the action of the heart.

**VERD-ANTIQUE.** See **MARBLE**.—*Oriental Verd-antique* is a green porphyry used as marble.

**VERDEN**, a town of Prussia, in Hanover, on the Aller, about 3 miles from its mouth in the Weser, and 21 miles south-east of Bremen. It has a fine Gothic cathedral, a gymnasium, breweries, distilleries, tanneries, and manufactures of cigars, soap, agricultural machinery, &c. Verden was formerly a bishopric. Pop. (1895), 9594.

**VERDI, GIUSEPPE**, Italian operatic composer, the last of the Italian school strictly so called, was born at Roncole, near Busseto, on Oct. 10, 1813. He became organist in his native place at a very early age, and received his earliest training in music while employed at Busseto. In 1829 he was enabled, through the kindness of some friends, to proceed to Milan to continue his studies, and nine years later he settled in that city. His first opera, *Oberto, Conte di San Bonifazio*, was produced with fair success in 1839, and in the following year the comic opera *Un Giorno di Regno* was composed, but had little success. *Nabuccodonosor*, performed in 1842, was well received, and *I Lombardi* (1843) and *Ernani* (1844)—libretto adapted from Hugo's *Hernani*, both of revolutionary tendency, scored great successes. These were followed by *I due Foscari* (1844), *Giovanna d'Arco* (1845), *Alzira* (1845), *Attila* (1846), *Macbeth* (1847), *I Masnadieri* (produced first in London, 1847), *Il Corsaro* (1848), *La Battaglia di Legnano* (1849), *Luisa Miller* (1849), and *Stiffelio* (1850). His first masterpiece, *Rigoletto*, appeared in 1851, and in 1853 his other two masterpieces, *Il Trovatore* and *La Traviata*, were first produced. *Les Vêpres Siciliennes* (1855), *Simon Boccanegra* (1857), *Un Ballo in Maschera* (1857), *La Forza del Destino* (1862), and *Don Carlos* (1867) followed. His later works show the influence of Wagner and other non-Italian composers, and as musical dramas are far in advance of his earlier works; a marked change in style being evidenced by *Aida* (1871), and after a long period of silence by *Otello* (1887) and *Falstaff* (1893)—the last a comic opera. Verdi wrote very little non-operatic music, and only his *Requiem Mass* (1874) is important in this connection. In 1874 he was created an Italian senator, and he received many other honours both from Italy and from other European countries. He died on Jan. 27, 1901. See the *Life* by Pougin (London, 1887), and the work by Monaldi (1897).

**VERESHTCHAGIN, VASILII**, a Russian painter, was born on Oct. 26, 1842. He was educated at the naval school in St. Petersburg, but, devoting himself to painting, he entered the St. Petersburg Academy. In 1861 he travelled in Germany, France, and Spain, and in 1864 he entered the *École des Beaux Arts* at Paris, where Gérôme was his master. He joined the Caucasian expedition under General Kaufmann in 1867, and in 1869 went to Siberia. In 1874 he went to India with the Prince of Wales, and afterwards settled in Paris. He took part in the Russo-Turkish war, and was wounded at Plevna. Since that time he has visited all the chief cities of Europe exhibiting his pictures. They are of immense size, extremely realistic, and treat chiefly of the horrors of war. Among war pictures are: *An Unexpected Attack*; *Before Victory*; *After Defeat*; *Assault on Plevna*; *After the Assault*; *Apotheosis of War*; *Wounded Returning*; *Our Prisoners*; *All*

*Quiet at Shipka*; &c. He has also taken up religious subjects, and his *Family of Jesus* and *The Resurrection* attracted some attention. He has written volumes of reminiscences, travel sketches, &c., some of which have been translated into English.

**VERNE, JULES**, French story-writer, born at Nantes on Feb. 8, 1828, was educated in his native city. With his successful story entitled *Cinq Semaines en Ballon* (Five Weeks in a Balloon), which appeared in 1863 in *Hetzel's Magasin Illustré*, he created a new kind of literature, the semi-scientific romance of the extraordinary, which he has made peculiarly his own by many other excellent works of the same type. Among these are the following: *Le Désert de Glace* (1867); *L'Île Mystérieuse*; *Le Tour du Monde en 80 Jours* (1873); *La Découverte de la Terre* (1878); *Les Cinq Cents Millions de la Bégum* (1879); *La Maison à Vapeur* (1880); *Mathias Sandorf* (1885); *Nord contre Sud* (1887); *Deux Ans de Vacances* (1888); *L'Île à Hélice* (1895); *Clovis Dardenter* (1896); *Face au Drapeau* (1896); *Le Sphinx des Glaces* (1897); *Le Village Aérien*; &c. Many of his works have been translated into English, and have been extremely popular, more especially *Around the World in Eighty Days*, and *The Mysterious Island*.

**VERONICA.** See **SPEEDWELL** (in *SUPP.*).

**VERONICA**, said to have been the name of a woman who, when Christ was carrying his cross, lent him her veil to wipe the sweat from his face, and on receiving it back found his likeness imprinted on the cloth. This wonderful cloth is said to be still preserved among the relics at St. Peter's, Rome, where it is only shown to a few persons of special rank. It is commonly supposed that the St. Veronica of the legend received this name in mistake, and that it arose from a misunderstanding and corruption of the term *vera icon*, true image, originally applied to the likeness itself.

**VERSEZ**, a town of Hungary, in the county of Temesvar, 42 miles south of the town of Temesvar, with which it is connected by railway. It is the see of a Greek bishop, and has silk-mills, and a large trade in silk and wine. There are remains of an old castle. Pop. (1900), 25,199.

**VESOUL**, a town of France, capital of the department Haute-Saône, at the mouth of the Colombine in the Dugeon, a left tributary of the Saône. It has a seminary, a college, a training school for teachers, a public library, a theatre, &c. Pop. in 1896, 10,083.

**VESZPRIM**, a town of Hungary, 60 miles south-west of Budapest. It is the see of a bishop, and among its buildings are a fine cathedral (fourteenth century), another handsome and still older church, an episcopal castle, a diocesan seminary, a Piarist gymnasium, a synagogue, and several convents. Pop. in 1900, 14,114.

**VIAREGGIO**, a rising watering-place of Northern Italy, on the coast of Tuscany, 50 miles W.N.W. of Florence. It is protected on the land side by a splendid pine wood (Pineta), and has fine bathing establishments, a long breakwater with a lighthouse, and a monument to Shelley (1894). Pop. 15,000.

**VIAUD, LOUIS MARIE JULIEN**, French novelist, better known by his pseudonym *Pierre Loti*, was born at Rochefort of Huguenot parents on Jan. 14, 1850. After a school education in his native town he entered the French navy in 1867, becoming midshipman in 1873 and attaining the rank of captain in 1899. He has seen, in the course of his calling or otherwise, a great part of the world, and descriptions of foreign scenery figure largely in his works. He served with distinction in the Tonkin campaign, but incurred official displeasure by describing the



cruel proceedings of French soldiers at Hué in a series of letters to the *Figaro* in 1883. In 1887 he was honoured by admission into the Legion of Honour, and in 1891 he was elected a member of the Academy, Zola being a rival candidate on the occasion. He has published many stories, tales, and sketches under the pseudonym Pierre Loti, among them being: *Aziyadé* (1877); *Rarahu* (1880), reprinted in 1882 as *Marriage de Loti*; *Le Roman d'un Spahi* (1881); *Fleurs d'Ennui* (1882); *Pêcheurs d'Islande* (1886), perhaps his chief work; *Madame Chrysanthème* (1887); *Japonneries d'Automne* (1889); *Au Maroc* (1890); *Le Roman d'un Enfant* (1890); *Fantôme d'Orient* (1892), a sequel to *Aziyadé*; *Le Désert* (1894); *Jérusalem* (1895); *La Galilée* (1895); *Ramuntcho* (1897); and *Figures et Choses qui passaient* (1898). Many of these have been translated into English. The novels of Loti are characterized by tenderness, delicacy, and a generally romantic, even melancholy, colouring.

**VIBORG**, an ancient town of Denmark, in the peninsula of Jutland, finely situated on a small lake of the same name, 40 miles north-west of Aarhus. It is the see of a bishop, and has a fine Romanesque cathedral, dating from the twelfth century and restored in 1863-76. The site of the old castle is now occupied by the Borgevold Park. The chief industrial establishments are tanneries, breweries, and machine-works. The port is Hjarbæk, 5 miles away, on the Ljmmfjord. Pop. in 1901, 8623.

**VIBORG**, in FINLAND. See **WIBORG**.

**VIBURNUM**, the genus to which the Guelder Rose, *Laurastinus*, and Wayfaring Tree belong.

**VICTORIA FALLS**. See **ZAMBESI**.

**VICTORIA NYANZA**, or **UKERWE**, a large fresh-water lake in Africa, the largest of the Nile lakes. It extends from 0° 45' N. to 2° 50' S., and from 31° 30' to 35° E., and lies about 3900 feet above sea-level. Including the numerous islands with which it is studded, it has an area of about 27,000 square miles. It receives numerous influents, the most important of which is the Kagera, which enters it on the west. Other tributaries of the lake are the Katonga on the west, the Nzoia on the north-east, the Shimiya on the south, and the Ruwana on the south-east. The lake is supposed to be partly fed by springs. The outlet of the lake, or Somerset Nile, which flows north-west to lake Albert Nyanza, whence it issues as the Nile proper, was discovered by Speke on the 28th of July, 1862. While the western shore of the lake is mostly flat, and the northern in many places marshy, the eastern shore presents high mountains. The Victoria Nyanza was discovered by Speke, who caught sight of its southern end near Muanza on the 4th of August, 1858, and it was afterwards, in 1861-62, visited and further explored by its discoverer, along with Grant, and between January and May, 1875, it was circumnavigated by Stanley. By the treaty of 1890 between Great Britain and Germany the northern portion forms part of British East Africa and the southern portion part of German East Africa, the dividing line being the parallel of 1° S. A railway from Mombasa on the east coast to the Victoria Nyanza was completed in 1901. See **UGANDA**.

**VIDIN**, or **VIDDIN**. See **WIDDIN**.

**VIERSSEN**, a town of Rhenish Prussia, in the district of Düsseldorf, 18 miles west of the town of that name, and 10 miles south-west of Crefeld. It has important manufactures of velvet, plush, linen, silk, and cotton fabrics; leather, tobacco, soap, straw-hats, &c. Pop. in 1895, 22,795; in 1900, 24,797.

**VIERZON-VILLE**, a town of France, in the department of Cher, situated on a hill in a fertile plain, at the junction of the Yèvre with the Cher,

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on the Canal du Berry, 19 miles north-west of Bourges, 124 miles south of Paris. It has manufactures of agricultural machinery, porcelain, glass, &c. Pop. (1896), 11,176.

**VILLACH**, a town of Austria, in Carinthia, on the river Drave, 20 miles west of Klagenfurt, with a fifteenth-century Gothic church, a gymnasium, a hospital, and other such buildings; also various manufactures. There are warm sulphur springs in the vicinity. Pop. in 1890, 7687.

**VILLAFRANCA DI VERONA**, a small town of Northern Italy, in the province of Verona, 10 miles S.S.W. of Verona. It is an old town of mediæval appearance, and is surrounded by walls and moats. The castle is now in ruins. The preliminaries of a peace between Francis Joseph of Austria and Napoleon III. of France were signed here on July 11, 1859.

**VILLA RICA**, a town of Paraguay, 90 miles south-west of Asuncion, with which it is connected by rail. It has a large cathedral and is generally well built. The trade is considerable and steadily increasing. Pop. in 1895, 19,000.

**VILLEFRANCHE-SUR-SAÔNE**, a town of France, in the department Rhône, on the Morgon, near the right bank of the Saône, about 20 miles N.N.W. of Lyons. Pop. in 1896, 13,627.

**VINDHYA MOUNTAINS**. See **INDIA**.

**VIRCHOW**, RUDOLF, a distinguished German pathologist and anthropologist, was born at Schivelbein, in Pomerania, on Oct. 13, 1821. He studied at the Friedrich Wilhelms-Institut in Berlin during 1839-43, and in the latter year became a surgeon's assistant. From 1844 to 1846 he was assistant at the Charité Hospital, and in the latter year he became prosecutor there. He qualified in 1847 as a lecturer at the University of Berlin, and in that year also he was associated with Benno Reinhardt in founding the Archiv für pathologische Anatomie und Physiologie und für klinische Medizin, which he edited alone from Reinhardt's death in 1852 till his own. He made himself known as a pronounced democrat in the year of revolution, 1848, and his political activity caused the government to remove him, in 1849, from his prosecutorship, but he was soon reinstated. Later in the same year he accepted the chair of pathological anatomy at Würzburg. In 1852 he became joint-editor of the *Cannstatt* reports on the progress of medicine, which he continued in conjunction with others till his death. In 1856 he returned to Berlin as professor of pathological anatomy, general pathology, and therapeutics, and director of the recently founded pathological institute. He was elected to the Prussian house of representatives in 1862, and became leader of the Progressive Party, and in 1880-93 he was a member of the Reichstag. He was a determined opponent of Bismarck's policy, and in 1865 he was challenged to a duel by the man of blood and iron. He exercised especial influence in matters relating to public health, and during the wars of 1866 and 1870-71 he took an active part in organizing the army sanitary services. As a member for several decades of the Berlin municipal council he was active in promoting the sanitary improvement of the city. In 1870 he assisted in founding the Deutsche und Berliner Gesellschaft für Anthropologie, Ethnologie, und Urgeschichte, of which he was several times president, and in 1879 he made a journey to the site of Troy, described in *Beiträge zur Landeskunde in Troas* (1879) and *Alttröjanische Gräber und Schädels* (1882). He visited England in 1893 and delivered the Croonian lecture to the Royal Society on *The Place of Pathology in Biological Studies*, receiving on the occasion

the honorary degree of D.C.L. from Oxford. In 1898 he delivered the Huxley lecture in London, his subject being Recent Advances in Physiology. He died in Berlin on Sept. 5, 1902. Virchow's numerous works include the following: *Handbuch der speciellen Pathologie und Therapie* (six vols., 1854-76), which he prepared in collaboration with others; *Vorlesungen über Cellularpathologie in ihrer Begründung auf physiologische und pathologische Gewebelehre* (1858), his chief work, forming in the fourth edition the first volume of *Vorlesungen über Pathologie* (four vols., 1863-71); *Vier Reden über Leben und Kranksein* (1862); *Ueber den Hungertyphus* (1868); *Ueber einige Merkmale niederer Menschenrassen am Schädel* (1875); *Beiträge zur physischen Anthropologie der Deutschen* (1876); *Gesammelte Abhandlungen aus dem Gebiete der öffentlichen Medizin und der Seuchenlehre* (1879); *Goethe als Naturforscher* (1861); *Die Freiheit der Wissenschaft im modernen Staat* (1877); &c. Several of these works have been translated into English. Virchow was the founder of cellular pathology.

**VIRGINIA CITY**, a city of the United States, capital of Storey county, Nevada, about 200 miles north-east of San Francisco, and connected with the Central Pacific Railway by a branch line 12 miles long. The silver mines here led to the rise of the place, the famous Comstock Lode and the Big Bonanza (or Virginia Consolidated) having yielded immense quantities of silver; but there has latterly been a great decline. Pop. (1880), 10,917; (1890), 8511; (1900), 2695.

**VIRGINIAN CREEPER**, the *Ampelopsis quinquefolia*, a climbing plant of the vine order (Vitaceae) native to North America. It has large palmate leaves, and is used as an ornamental covering for walls, &c., and sometimes called *American Ivy*. Its leaves turn a bright red in the autumn.

**VIRGINIAN DEER**. See **CARIACOU**.

**VITI LEVU**. See **FUJI**.

**VIZAGAPATAM**, a town of British India, capital of a district of the same name, in the Madras Presidency, at the entrance of the Veragatam into the Bay of Bengal, about 180 miles north-east of Masulipatam. It is a military station and has a good harbour. Pop. (1891), 34,487; (1901), 40,892.

**VLAARDINGEN**, a town of the Netherlands, in the province of South Holland, on the New Maas, 6 miles west of Rotterdam. It is a seat of the Dutch herring-fishery, and has a neat town-hall and a good harbour. Pop. (1897), 13,529.

**VLADIKAVKAZ**, a town of Russia, in Caucasia, capital of Terek district, situated on an elevated plane at the northern base of the Caucasus, about 90 miles north of Tiflis, with which it is connected by a military road through the Dariel gorge. It is connected by rail with Rostov and with Petrovsk on the Caspian, and is rapidly developing as a commercial centre. Pop. (1897), 43,843.

**VLADIVOSTOK** (lit. 'mistress of the East'),

in Chinese *Hai-san-vai*, a Russian fortified seaport and place of arms, capital of the Maritime Province of Eastern Siberia, is situated near the extremity of a peninsula jutting into Victoria or Peter the Great Bay. Though only founded about 1860 Vladivostok is now the most important Russian station in this quarter, the government having spent large sums on wharfs, ship-yards, and arsenals. The trade is as yet of little importance, and is chiefly in the hands of Chinese. It is a terminus of the railway across Siberia. Pop. (1897), 28,896.

**VOLAPÜK**, the name given to a universal language invented about 1879 by Johann Martin Schleyer, of Constance. The name means 'world-speech', being based on English *world* and *speak*, and a number of the vocables are modified English words, the total number in the language being about 14,000, some 1300 being root-words. In structure the language is simple and extremely regular, and the orthography is entirely phonetic, the words being pronounced as they are written, and *vice versa*. The study of Volapük, after having made some progress, has latterly declined; but there are still periodicals written in it, and associations devoted to its dissemination. Various other attempts to provide a universal language, especially one suited for commercial purposes, have been made in recent times.

**VOLO**, or **VOLOS**, a seaport of Greece, in Thessaly, on the Gulf of Volo, 37 miles to the south-east of Larissa, with which and with Trikkala it has railway connection. It is the capital of an eparchy of the same name, in the nomarchy of Larissa, and carries on a fair trade in cotton, grain, wool, oil, &c. Pop. (1896), 16,232.

**VRYHEID**, a town of South Africa, formerly in the Transvaal, now in Natal, about 280 miles north of Durban by the railway through Pietermaritzburg, Ladysmith, and Dundee, in the centre of a district containing coal, gold, and other minerals. It has Dutch Reformed, Anglican, Wesleyan, and other churches, a masonic temple, schools, and mineral springs. The district of Vryheid was ceded to a party of Boers by Dinizulu, a Zulu chief, in return for military assistance rendered to him in 1884, and it was thereupon constituted a separate state under the title of the New Republic. In 1888 it was incorporated in the Transvaal. The white population of the district is about 5800; of the town, 2400.

**VYRNWY**, a river of Wales, rising in the north-west of Montgomeryshire, and after a circuitous course of some 35 miles falling into the Severn on the Shropshire border. Lake Vyrnwy, not far from its source, the chief reservoir of the Liverpool water-works, has been formed by constructing a huge dam or embankment across the river valley, the result being an artificial sheet of water about 5 miles long. The length of the embankment is about 1260 feet, its height 60, the length of the aqueduct to Liverpool 68 miles.

## W.

**WADEBRIDGE**, a town of England, in Cornwall, at the head of the estuary of the Camel, 6 miles w.n.w. of Bodmin. The river Camel is here crossed by a stone bridge of fifteen arches which was originally constructed in 1485. The town has a trade in granite, slate, and other products of the county. Pop. (1891), 1819; (1901), 2186.

**WAITZEN**, a market-town and bishopric of Hungary, on the left bank of the Danube, 20 miles north of Budapest. It has a splendid cathedral, and several important monastic and scholastic establishments. Pop. (1890), 14,450; (1900), 16,808.

**WAKAYAMA**, a town of Japan, on the island of Honshu, situated on the east coast of the channel

leading into the eastern end of the Inland Sea, 35 miles south-west of Osaka. It is an important centre of the cotton industry. Pop. (1899), 63,667.

**WALKER**, a town of England, in Northumberland, on the left bank of the Tyne, 2 miles east of Newcastle, with modern churches, a mechanics' institute, the Newcastle hospital for infectious diseases, a colliery, ship-building, iron-founding, chemical-works, &c. Pop. (1891), 11,341; (1901), 13,335.

**WALLAROO**, a town of South Australia, in Daly county, near the east shore of Spencer Gulf and Wallaroo Bay, 91 miles north-west by north of Adelaide. The Wallaroo and other copper-mines are in the neighbourhood, and the largest smelting-works in the colony are carried on at Wallaroo Bay. Gold and silver are also extensively worked. Pop. 3500.

**WALLASEY**, an urban district or town of England, in Cheshire, near the seaward extremity of the Wirral peninsula, 2 miles north-west of Birkenhead. It has a church (rebuilt since its destruction by fire), a working-men's institute, a sixteenth-century grammar-school (reorganized), a cottage hospital, &c. Pop. (1891), 33,229; (1901), 53,580.

**WALMER**, a suburb of Deal, in Kent, with an ancient and modern churches, a Royal Marine Infirmary, and Walmer Castle, the official residence of the Lord Warden of the Cinque Ports. Pop. (1891), 4565; (1901), 5248.

**WALTHAMSTOW**, an urban district, parl. div., and suburb of London, in Essex, 6 miles north-east of St. Paul's. It has a town-hall, a literary institute, a public library, a school of art, several good higher schools, one of them dating from the sixteenth century, &c. Brewing is the chief industry. Pop. of town in 1891, 46,346, of parl. div. 101,236; in 1901, 95,125 and 185,567.

**WALTON-LE-DALE**, a town of England, in Lancashire, on the left bank of the Ribble, 2 miles south-east of Preston, in which parliamentary borough it is included. It has an ancient church, modern places of worship, a working-men's institute, cotton-spinning, market-gardening, &c. Pop. (1891), 10,556; (1901), 11,271.

**WALTON-ON-THAMES**, a town of England, in Surrey, on the right bank of the Thames, here crossed by an iron bridge, 5 miles w.s.w. of Kingston, with an ancient church of some interest, a Wesleyan chapel, a public hall, the Metropolitan Convalescent Institution, water-works, &c. It is a popular residential district and tourist resort. Pop. (1891), 7988; (1901), 10,329.

**WALTON-ON-THE-NAZE**, or **WALTON-LE-SOKEN**, a watering-place of England, on the coast of Essex, 16 miles west by south of Colchester, with a church representing an older building swept away by the sea in 1798, other places of worship, a public hall, a coast-guard and a life-boat station, a convalescent home and a home of rest, &c. There is an excellent beach. Pop. (1891), 1586; (1901), 2014.

**WANSTEAD**, a town of England, in Essex, near the right bank of the Roding, 6 miles north-east of St. Paul's, with a brick church in Classic style. Beside it is Wanstead Park, belonging to the Corporation of the City of London, and opened to the public in 1882; and Wanstead Flats, partly planted by the labour of the London unemployed in 1886. Pop. (1891), 7043; (1901), 9179.

**WANTAGE**, a market-town of England, in Berkshire, in the fertile vale of the White Horse, 13 miles west by south of Wallingford, birthplace of King Alfred, of whom there is a statue. There is an interesting old church, a town-hall, a corn-exchange, a grammar-school, and a cottage hospital. Iron and brass founding, and the manufacture of sacks and similar articles, are carried on. Bishop

Butler was a native of Wantage. Pop. (1891), 3669; (1901), 3766.

**WARD**, **ADOLPHUS WILLIAM**, English historian, was born at Hampstead on Dec. 2, 1837. He received his education in Germany and at the grammar-school of Bury St. Edmunds, and in 1854 he entered Peterhouse, Cambridge. A few years later he graduated with distinction in classics and became a fellow of his college. In 1866 he was appointed to the chair of history and English literature in Owens College, Manchester, an institution of which he was principal from 1888 till his resignation in 1897. He took a leading part in the movement for the foundation of Victoria University, and he has held several important offices in connection with it. In 1900 he became master of Peterhouse, and in 1901 vice-chancellor of Cambridge University. In 1902 he was appointed an original member of the new British Academy for the Promotion of Historical, Philosophical, and Philological Studies. In 1868-73 he published a translation of Curtius's *History of Greece* in five volumes, and in 1875 his valuable *History of English Dramatic Literature to the Death of Queen Anne* appeared in two volumes (new edition, 1899). Among his other works are: *The House of Austria in the Thirty Years' War* (1869); *Chaucer* (1880) and *Dickens* (1882) in the *English Men of Letters* series; *The Counter-Reformation* (1888); *Sir Henry Wotton* (1897); *Great Britain and Hanover* (1899); and numerous contributions to the *Encyclopædia Britannica*, the *Dictionary of National Biography*, and various reviews. He has also edited various English classics, among them being *Pope's Works* (Globe Edition), *Marlowe's Doctor Faustus* and *Greene's Friar Bacon*, *John Byrom's Poems* (two vols., Chetham Society), &c. He is one of the editors of the *Cambridge Modern History* (first volume, 1902), planned by Lord Acton. He is honorary LL.D. of Glasgow, and honorary Litt.D. of Cambridge and Victoria University.

**WARD**, **MARY AUGUSTA**, novelist, better known as *Mrs. Humphry Ward*, daughter of Thomas Arnold, second son of Dr. Arnold of Rugby, was born on June 11, 1851, at Hobart, Tasmania, where her father held an educational post. In 1872 she married Mr. Thomas Humphry Ward, M.A., formerly a fellow and tutor of Brasenose College, Oxford. She contributed a large number of articles to *Smith and Wace's Dictionary of Christian Biography*, and wrote much for *Macmillan's Magazine*, but her first separately published work was a story for children, entitled *Milly and Olly: or, A Holiday among the Mountains*, which appeared in 1881, with illustrations by Mrs. Alma-Tadema. In 1884 her first novel, *Miss Bretherton*, in which she dealt with stage life in London, was published, and next year appeared her excellent translation of the *Journal Intime of Henri Frédéric Amiel*, with introduction and notes. *Robert Elsmere* (1888), a novel dealing with the gradual development of a young Anglican clergyman from orthodox dogmatic Christianity towards a more liberal and somewhat indefinite set of opinions, met with great success, and was soon translated into several foreign languages. In *The History of David Grieve* (1892) she produced a novel of a somewhat similar type but much less powerful; and in *Marcella* (1894) she dealt with modern social questions. *Sir George Trevelyan*, in some sort a continuation of *Marcella*, and, like it, treating of modern political and economic questions, was published in 1896. With *Helbeck of Bannisdale* (1898) she returned to the main theme of *Robert Elsmere*, but *Eleanor* (1900) is a study of political and religious life in Italy. Her latest novel is *Lady Rose's Daughter* (1902). She has been asso-

ciated with the work of the Passmore Edwards Settlement since its foundation.

**WARREN, SIR CHARLES**, British general, second son of Major-general Sir Charles Warren, K.C.B., was born at Bangor on Feb. 7, 1840. From a school at Bridgenorth he proceeded to Cheltenham College, and he afterwards received a military education at Sandhurst and Woolwich. He joined the Royal Engineers in 1857, and in 1861-65 he was engaged in a survey of Gibraltar. During the three years following 1867 he carried out exploring work in Palestine for the Palestine Exploration Fund, and from 1871 till 1873 he studied in the gunnery-school at Shoeburyness. In 1876 he was a commissioner for settling the western boundary of the Orange Free State, and in the following year he assisted in settling the land question of Griqualand West. He commanded the Diamond Fields Horse in the Kafir war of 1878, and during the immediately succeeding Griqua and Bechuana campaigns he was commander of the field force. After a short period of service as administrator of Griqualand West he returned to England in 1880, and during the next four years he was attached to the Chatham school of military engineering as instructor in surveying. He was in Egypt and Arabia for a short time in 1882, in which year he attained the rank of colonel in the Royal Engineers. He commanded the Bechuana-land expedition of 1884-85, when the Transvaal Boers were checked in their encroachments, and in the following year he was in command at Suakim. From 1886 till his resignation in 1888 he was chief commissioner of the metropolitan police, and for five years from 1889 he was in command of the troops in the Straits Settlements, with the temporary rank of major-general. He was commander of the Thames district from 1895 till 1898. Sir Charles Warren commanded a division in the South African war of 1899-1902, and co-operated with Sir Redvers Buller in that attempt to relieve Ladysmith with which the occupation of Spion Kop is prominently associated. He was afterwards appointed military governor of Griqualand West. He was created C.M.G. in 1878, K.C.M.G. in 1883, G.C.M.G. in 1885, and K.C.B. in 1887, and is a fellow of the Royal and other societies. He has published works entitled *Underground Jerusalem* (1876); *The Temple or the Tomb* (1880); and, in collaboration with Captain C. R. Conder, *Jerusalem* (1884).

**WASHINGTON**, an island in the Pacific Ocean, belonging to Britain, in lat.  $4^{\circ} 40' N.$ , lon.  $160^{\circ} 20' W.$  It is also called New York island. Its area is 6 square miles.

**WATER-GAS**, a mixture of gases produced by the action of steam on incandescent carbon. The carbon first decomposes the steam, forming hydrogen and carbon dioxide, and the latter gas then combines with more carbon to form the inflammable carbon monoxide. Thus water-gas is mainly a mixture of hydrogen and carbon monoxide. Pure water-gas is non-luminous, but it is rendered luminous by mixing with various gases obtained from petroleum, the luminous mixture being known as carburetted water-gas. Two chief methods are employed for the manufacture of water-gas for illuminating purposes. In the first of these, the Lowe process, the preparation of the pure gas and the carburetting are performed in one operation. The apparatus consists essentially of a generator, filled with anthracite or coke, in which the non-carburetted gas is produced; a carburetter, a circular chamber lined with fire-brick and filled with a checker-work of the same material; and a superheater, a taller circular chamber similarly filled. By means of air-blasts and the producer-gas from the anthracite of the generator, the

fire-bricks of the carburetter and the superheater are raised to a red heat, and then superheated steam is passed through the incandescent carbon. The water-gas formed passes over into the carburetter, where it becomes mixed with illuminant gases formed by the action of the heated bricks on mineral oil, which is introduced from above. This process is completed in the superheater, and the carburetted gas is then ready for purification. In the Wilkinson process the operations of making the gas and carburetting are separate. In the United States carburetted water-gas has largely replaced coal-gas as an illuminant, partly because of its brighter light, and partly because it can be more cheaply manufactured in that country. Coal-gas is often mixed with carburetted water-gas in order to increase its illuminating power. The chief objection to the use of water-gas as an illuminant is the highly poisonous nature of one of its essential constituents, namely, carbon monoxide. Water-gas is also used in the non-carburetted condition as a fuel.

**WATER-GLASS**, a substance which, when solid, resembles glass, but is slowly soluble in boiling water, although it remains unaffected by ordinary atmospheric changes. It consists of soluble silicates of potash or soda, or a mixture of both. A substance of this kind was first discovered, so far as is known, by Van Helmont in 1640. In the nineteenth century Dr. Johann Fuchs, of Munich, did much to improve the mode of preparing and applying it, and much also has been done in the same direction by Mr. Ransome, of Ipswich. Water-glass may be prepared in two ways, called *wet* and *dry*. The former mode of preparation consists in breaking down and calcining flint nodules, the fragments or particles of which are then added to a solution of caustic potash or soda, whereupon the whole is exposed for a time to intense heat at 60 pounds pressure. According to the latter method the constituents are fused together in the solid state and afterwards dissolved. The product when prepared in this way is viscid, and may be used in this state or further diluted. In this method of manufacture the caustic soda or potash may be replaced by the carbonate or the sulphate. Potash water-glass is more soluble than soda water-glass, and if both metals be present a still more soluble glass, called *double soluble glass*, is obtained. Among the purposes to which water-glass is applied are painting on glass, coating stone, wood, and other materials to render them water-proof, glazing scenery and paintings, &c. It is also used mixed with sand to make an artificial stone, and it forms an ingredient in some kinds of cement. One of the most valuable of its applications is in the fixing of wall-paintings, which are more durably fixed by means of it than by the ordinary processes of fresco-painting. The name of *stereochromy* has been given to this process. It is also added to many kinds of soap, and used to fix colours in calico-printing. See **FUCHS' SOLUBLE GLASS**.

**WATERHOUSE, ALFRED**, English architect, born at Liverpool on July 19, 1830, studied architecture in Manchester, and afterwards in France and Italy. He began practice in Manchester in 1853, and first made his name known by the Assize Courts of that city. For the same city he has since designed the County Jail, Owens College, the Town Hall, St. Mary's Hospital, and other buildings. In other parts of England he has been responsible for the following amongst other buildings: in Liverpool, Seaman's Orphanage, Turner Memorial Home, Royal Infirmary, and University College; in London, Natural History Museum, New St. Paul's School, City and Guilds Central Institution, King's Weigh House Chapel, and University College Hospital; in

Oxford, Balliol College (partly rebuilt); in Cambridge, Caius and Pembroke Colleges (partly rebuilt); in Leeds, Yorkshire College; in Brighton, the Hotel Métropole; and the mansions of Eaton Hall (Cheshire), Heythrop (Oxford), and Iwerne Minster (Dorset). He was elected A.R.A. in 1878, and R.A. in 1885, and in 1898 he became treasurer of the Academy. He received a Grand Prix from the Paris exhibition of 1867, and he is a member of various foreign academies. In 1878 he was awarded the gold medal of the Royal Institute of British Architects, of which he was president during 1888-90. He received the honorary degree of LL.D. from Victoria University in 1895.

**WATERLOO**, a town and watering-place of England, on the Lancashire coast, 4 miles N.N.W. of Liverpool, forming with Seaforth one urban district. Pop. (1891), 17,225; (1901), 23,101.

**WATERTON**, CHARLES, English naturalist, was born at Walton Hall, Wakefield, on June 3, 1782, and died on May 27, 1865. He was educated at the Roman Catholic College at Stonyhurst, where he evinced a great taste for natural history. He spent many years in travel, and in 1825 published *Wanderings in South America, the North-West of the United States, and the Antilles* in the years 1812, 1816, 1820, and 1824, a book which has had great popularity. An illustrated and slightly altered edition was published under the direction of J. G. Wood in 1879. His only other publication is *Essays in Natural History, with an Autobiography*. These appeared originally in three series (1838, 1844, 1857). In 1870 Norman Moore produced a new edition of them, together with some of his letters and a life. He lived a secluded life for many years at Walton Hall, where he formed a curious collection of animals.

**WATERTOWN**, a city of the United States, capital of Jefferson county, New York, on the south bank of Black River, 8 miles above its entrance into Lake Ontario. Among the chief buildings and institutions are the county buildings, many churches, a convent, state armoury, county jail, a high-school, business college, &c. The river is crossed by several bridges, and its rapids afford abundant water-power. The manufactures consist of woollens, agricultural implements, sewing-machines, &c. Pop. (1890), 14,725; (1900), 21,696.

**WATERTOWN**, a city of the United States, in Wisconsin, on both sides of the Rock River, 44 miles west by north of Milwaukee. Among its educational institutions are the North-Western University (Lutheran) and the College of Our Lady of the Sacred Heart. It is one of the chief railway centres of the state. The river yields abundant water-power. Pop. (1890), 8755; (1900), 8437.

**WATERVLIET**, formerly WEST TROY, a city of the United States, in Albany county, New York, on the Hudson opposite Troy. There is here an arsenal where ordnance, shot, shell, &c., are manufactured. Pop. (1890), 12,967; (1900), 14,321.

**WATH-UPON-DEARNE**, a town of England, in Yorkshire (West Riding), 10 miles N.N.E. of Sheffield, with an ancient church (restored), other places of worship, local board offices, an endowed school, a market-place, a mechanics' institute, coal and iron works, stone-quarries, oil and soap works, a brewery, &c. Pop. (1891), 7048; (1901), 8519.

**WATLINGS ISLAND**, one of the Bahamas islands, situated approximately in lat. 24° N. and lon. 74° 30' W. This island is now generally regarded as the San Salvador of Columbus. The native name was Guanahani.

**WATSON**, WILLIAM, poet, was born at Burley-in-Wharfedale, Yorkshire, on Aug. 2, 1859. His

first volume of verse, *The Prince's Quest*, and other Poems, published in 1880, showed the influence of Keats and William Morris, and found favour with D. G. Rossetti. Four years later he issued his *Epigrams of Art, Life, and Nature*, containing much highly-finished work, but it was not till the publication of *Wordsworth's Grave*, and other Poems, in 1890 that he gained adequate recognition from the public. The volume of his Poems published in 1892 was a reprint of the 1890 volume with the addition of twenty-six new pieces. Of *Lachrymæ Musarum*, and other Poems (1892), the title-poem is a fine eulogy of the late Lord Tennyson. The *Eloping Angels* followed in 1893, *Odes*, and other Poems, in 1894, and *The Father of the Forest*, and other Poems, in 1895. To 1896 belong two volumes of sonnets on the Armenian atrocities, with the titles *The Year of Shame* and *The Purple East*. In the main poem of *The Hope of the World*, and other Poems (1898), and also elsewhere in the same volume, he gives utterance to the higher agnosticism, and betrays a kind of pessimism. His *Collected Poems* (1898) ought rather to be called *Selected Poems*, since from them are excluded all of the 1880 and 1893 volumes, more than half of the *Epigrams*, most of *The Year of Shame*, and portions of the other volumes. Mr. Watson has also edited an anthology of *Lyric Love* (1892), and has issued a volume of literary criticism, entitled *Excursions in Criticism* (1893). Mr. Watson's poetry, with much beauty of expression and depth of thought, is generally lacking in spontaneity and true originality. He has a fine touch in epigram.

**WATTLE**, **WATTLE-TREE**, a name given to several Australian species of *Acacia*. See *ACACIA*, *AUSTRALIA*.

**WATTS**, GEORGE FREDERICK, a distinguished painter of portraits and ideal subjects, was born in London on Feb. 23, 1817, and studied in the schools of the Royal Academy. In 1837 he exhibited at the Royal Academy two portraits of young ladies and a subject-picture entitled *The Wounded Heron*, and since then he has contributed to various art exhibitions, notably the Royal Academy, the Grosvenor Gallery, and the New Gallery, about three hundred pictures of various kinds. Some of these are landscapes and seascapes; a few, such as *The Sempstress* and *Under the Arch*, portray contemporary life; but the finest and most characteristic are portraits and allegorical or ideal subjects. His portraits include those of Lady Holland (1843), Tennyson (1859), The Duke of Argyll (1860), Robert Browning (1865), Thomas Carlyle (1869), Sir J. E. Millais (1871), Rev. James Martineau (1874), E. Burne Jones, Esq. (1877), Himself (1879), Mr. Gladstone (1879), Mr. William Morris (1880), Lord Leighton (1890), Mr. Walter Crane (1891), Prof. Max Müller (1895), Rt. Hon. Gerald Balfour (1899), and Major-General Baden-Powell (1902). Of his other pictures the following may be mentioned: *Isabella finding Lorenzo dead* (1840); *How Should I your True Love Know* (1841); *Cymbeline* (1842); *Paolo and Francesca* (1848); *Orlando pursuing the Fata Morgana* (1848); *Life's Illusions* (1849); *The Good Samaritan* (1850); *The Window-seat* (1862); *Sir Galahad* (1862); *Ariadne* (1863), one of his best works; *Virginia* (1863); *Choosing* (1864); *Esau* (1865); *Thetis* (1866); *May* (1867); *The Meeting of Jacob and Esau* (1868); *The Wife of Pygmalion* (1868); *The Return of the Dove to the Ark* (1869); *Una and the Red Cross Knight* (1869); *Daphne* (1870); *Fata Morgana* (1870); *The Curse of Cain* (1872); *The Prodigal* (1873); *Dedicated to all the Churches* (1875); *The Dove that returned not Again* (1877); *Love and Death* (1877);

Time and Death (1878), like the preceding, one of his most notable pictures; Britomart and her Nurse (1878); Orpheus and Eurydice (1879); Paolo and Francesca (1879); Enid and Geraint (1879); Psyche (1880); The Rider on the Pale Horse, The Rider on the Black Horse, The Rider on the White Horse, and The Rider on the Red Horse, all apocalyptic pictures of 1883; Love and Life (1884); Rain Passing Away (1884); The Angel of Death (1888); The Wife of Plutus (1889); She shall be called Woman (1892), a large picture of Eve; For he had great Possessions (1894); The Outcast (1895); Jonah (1895); The Childhood of Jupiter (1896); Eve Tempted and Eve Repentant (1896); Love Triumphant (1898); The Return of Godiva (1900); In the Highlands (1901); Court of Death (1902). In 1843 his cartoon of Caractacus led in Triumph through the Streets of Rome obtained one of the three highest prizes in the Westminster Hall Competition. He was in Italy during 1843-47, and was powerfully influenced by Titian and Tintoretto. In 1847 his colossal oil-pictures of Echo and Alfred inciting the Saxons to prevent the Landing of the Danes were awarded a prize of £500 in another Westminster Hall competition. The latter of these now adorns a committee-room of the Houses of Parliament. He completed a fresco, St. George overcomes the Dragon, in 1853, for the Houses of Parliament, and at a later date he painted in fresco the west end of the new hall at Lincoln's Inn. Since 1896 he has been on the list of retired academicians. A large number of his portraits, presented by him to the nation, are now in the National Portrait Gallery, and some of his best allegorical paintings were presented to the National Gallery of British Art (Tate Gallery). To use his own words, he paints ideas rather than objects, and the poetic idealism to which he has been faithful throughout all his long career stands in the way of extensive popularity. His drawing is of the utmost correctness and his colouring often extremely fine. In portraiture he takes a foremost place, and he has produced some important works of sculpture.

WATTS-DUNTON, THEODORE, poet, critic, and novelist, was born at St. Ives in 1836. He was educated privately at Cambridge and for a time studied law, but he soon found his true vocation in literature. He had already gained a reputation as a writer of sonnets when he joined the staff of the Examiner as literary and art critic. On leaving the Examiner he joined the Athenæum staff, and for many years he has been one of the chief contributors to that review, his criticisms of poetry being of the most illuminating character. In 1897 he published a poem entitled Jubilee Greeting at Spithead to the men of Greater Britain, which met with wide appreciation; and in the same year he collected in *The Coming of Love*, and *Other Poems*, some of the more important of his poetical contributions to the Athenæum and other literary journals. *Aylwin*, a novel or romance published in 1898, forms a striking prose counterpart to *The Coming of Love*, and contains excellent pictures of gypsy life. Mr. Watts-Dunton has also contributed largely to the *Nineteenth Century* and other periodicals, and several of the notices in Ward's *English Poets* are from his pen. The article on poetry in the *Encyclopædia Britannica* was written by him. He was intimately associated with D. G. Rossetti and William Morris, and was also a close friend of Lord Tennyson. Till 1896 he was known as Theodore Watts, but in that year he added his mother's name Dunton.

WAX INSECTS. See CHINA WAX.

WAYFARING TREE (*Viburnum Lantana*), a

shrub of the Guelder Rose genus (order Caprifoliaceæ), with opposite toothed leaves, and flowers in cymes, the ripe fruits being black berries. It is found wild in some parts of Britain.

WAZIRISTAN, the country of the Waziris, a region of North-Western India, situated west of the Suliman range, north of British Baluchistan, and east of Afghanistan. It is now partly included in British India, and has at various times been the scene of military operations, as, for instance, in 1902. It is a mountainous country, with much fine scenery, and a delightful climate except in some of the valleys. The Waziris, a portion of whom are known as Mahsuds, are a hardy race.

WEALD. See KENT, SUSSEX.

WEDNESFIELD, a north-eastern suburb of Wolverhampton, in Staffordshire, with extensive manufactures of locks, keys, traps, files, and similar articles. Pop. (1891), 4328; (1901), 4883.

WEI-HAI-WEI, a seaport in China, in the province of Shantung, situated near the entrance of the Strait of Pe-chi-li, on a bay sheltered by an island, some 40 miles east of Chefoo. By a convention of date July 1, 1898, the port of Wei-hai-wei, together with the adjacent waters and some neighbouring territory, was leased to Great Britain for as long a period as Russia shall hold Port Arthur. The leased territory includes the island of Liu Kung, all the islands in the bay, and a belt of land 10 miles wide along the whole coast of the bay; area, 280 square miles; pop. 120,000. By the terms of the lease Great Britain has sole jurisdiction within the limits of this territory, but within the walls of the city Chinese officials may exercise such authority as is not inconsistent with the defence of the territory. The British government may also erect fortifications and carry out other defensive works in a defined region lying outside of the leased territory. Chinese war-vessels retain the right to use the waters. Wei-hai-wei is not to be fortified, but is intended to be a naval base, place of exercise, and sanatorium for the British squadron on the China station.

WEINHEIM, a town of South Germany, in Baden, on the Weschnitz, 10 miles north of Mannheim, with manufactures of leather, machinery, dyes, soap, &c., besides silk-dyeing, tanning, and other industries. There are remains of fortifications, old castles, a town-house of the sixteenth century, various schools, &c. Weinheim is a much-frequented health resort. Pop. (1895), 9676; (1900), 11,168.

WEIR, a dam erected across a river to stop and raise the water, either for the purpose of taking fish, of conveying a stream to a mill, or of maintaining the water at the level required for navigating it, or for purposes of irrigation.

WEIR, HARRISON WILLIAM, English artist, was born at Lewes, Sussex, on May 5, 1824, and educated at an academy in Camberwell. He learned the profession of wood-engraver, but having no liking for it he turned his attention to painting, and as an artist is practically self-taught. His first exhibited picture was in oil, and was entitled *The Wild Duck* (1843). In 1847 he was elected a member of the New Society of Painters in Water Colours. He is chiefly noted for his pictures of country life, animals, fruit, flowers, and landscapes. As an illustrator of books and periodicals he is well known. He is the author and illustrator of *The Poetry of Nature*; *Every-day Life in the Country*; *Animal Stories*; *Old and New*; *Our Cats*, and *All About Them*; &c. He devotes much of his time to the breeding of poultry, pigeons, and cats, and to horticulture.

WEISSENBURG (French *Wissembourg*), a town of Germany, in Elsass-Lothringen (Alsace-Lorraine),



36 miles north of Strasburg, finely situated on the Lauter at the foot of the Vosges Mountains. Among the most noteworthy buildings are the town-house and the Roman Catholic church. In the Franco-German war it was taken by the Germans. Pop. (1895), 6260.

**WEISSENFELS**, a town of Prussia, in the government of Merseburg, in the province of Saxony, on the Saale, 20 miles south of Halle, with manufactures of sugar, machinery, paper, porcelain, shoes, woollen fabrics, gold and silver articles, &c. It has a seventeenth-century castle, and a church containing the remains of Gustavus Adolphus. Pop. (1895), 25,981; (1900), 28,201.

**WELLE**. See **MOBANGI** in SUPP.

**WELLS**, or **WELLS-NEXT-THE-SEA**, a town of England, on the north coast of Norfolk, with an ancient church, rebuilt since its destruction by fire in 1879, a life-boat station, a promenade, and good facilities for boating and bathing. Pop. (1891), 2555; (1901), 2494.

**WEMBLEY**, an urban district of England, in Middlesex, 9 miles W.N.W. of St. Paul's, with a Gothic church designed by Sir G. G. Scott, a workmen's hall and institute, &c. Wembley Park belongs to a private company and contains an unfinished tower intended to exceed the Eiffel Tower in height. Pop. (1891), 3023; (1901), 4568.

**WERRA**. See **WESER**.

**WESLEYAN METHODISTS**. See **METHODISTS**.

**WEST BAY**, a city of the United States, in Bay county, Michigan, on the Saginaw river, near its mouth, and opposite Bay City. It has an extensive trade in lumber. Pop. (1900), 13,119.

**WESTCHESTER**, a town of the United States, charmingly situated in a fertile district of Pennsylvania, capital of Chester county, 27 miles west of Philadelphia. It contains a State normal school, the county hospital, &c. Pop. (1900), 9524.

**WESTCOTT**, **BROOKE FOSS**, English bishop, biblical critic, and theologian, was born in Birmingham in January, 1825, and was educated at King Edward the Sixth's School, where he made the acquaintance of E. W. Benson and J. B. Lightfoot. In 1844 he became a scholar of Trinity College, Cambridge, where he gained great distinction and graduated in 1848. He was elected a fellow of his college in 1849, and in 1851 he was ordained by Bishop Lee of Manchester, his former head-master at Birmingham. In 1852 he was appointed an assistant master at Harrow, and here he remained till 1869, when he became a residentiary canon at Peterborough. He left Peterborough in 1883, when he was appointed examining chaplain to the Archbishop of Canterbury and Canon of Westminster. On the death of his friend Lightfoot, Bishop of Durham, he was appointed his successor in 1890, and in this see he remained till his death. He showed a deep interest in the lot of the miners in his diocese, which won him their genuine esteem, and he was very successful in preventing and settling industrial disputes. From 1870 to 1890 he held the regius professorship of divinity at Cambridge, and during his tenure of the office he exercised a powerful and abiding influence on undergraduates and scholars. He died at Bishop Auckland on July 27, 1901. As a scholar and theologian Dr. Westcott's position was a very high one. As a textual critic he is best known for his share in the revision of the Greek text of the New Testament, which occupied him and Dr. Hort for twenty-eight years, and resulted in the publication of their important work, *The New Testament in the original Greek*, in 1881. This text formed the basis of the Revised Version of the New Testa-

ment. Dr. Westcott's other published works include the following: *General Survey of the History of the Canon of the New Testament during the first four Centuries* (1855), a standard work which has gone through many editions; *Characteristics of the Gospel Miracles: Sermons preached before the University of Cambridge* (1859); *Introduction to the Study of the Gospels* (1860), another work of much value which has gone through numerous editions; *The Bible in the Church* (1864); *The Gospel of the Resurrection* (1866); *A General View of the History of the English Bible* (1868); *The Paragraph Psalter* (1879); *The Gospel According to St. John* (1882), in the *Speaker's Commentary*; *The Revelation of the Risen Lord* (1882); *The Revelation of the Father: Titles of the Lord* (1884); *Christus Consummator: Some Aspects of the Work and Person of Christ in Relation to Modern Thought* (1886); *Social Aspects of Christianity* (1887); *The Epistle to the Hebrews* (1889); *Essays in the History of Religious Thought in the West* (1891), a work of profound and suggestive thought; *The Gospel of Life* (1892); *The Incarnation and Common Life* (1893); *Lessons of the Revised Version of the New Testament* (3rd ed., 1898); *Christian Aspects of Life* (2nd ed., 1897); and *Words of Faith and Hope* (1902), a posthumous volume of sermons and addresses. Dr. Westcott was one of the New Testament revision company, and he was president of the Christian Social Union from its foundation till his death.

**WEST DERBY**, a township of England, in Lancashire, now giving name to a parl. division of the borough of Liverpool, situated to the north-east of that city. It is a wealthy residential suburb of Liverpool. It has a church designed by Sir G. G. Scott, an old court-house, Roman Catholic industrial schools, a large cemetery, two public parks, &c., and the Liverpool Botanic Gardens are situated here. Pop. of div. (1891), 76,971; (1901), 86,694.

**WEST HOUGHTON**, a township in Lancashire, 5 miles W.S.W. of Bolton, with manufactures of silk and cotton, and coal-mining. Pop. (1891), 11,077; (1901), 14,377.

**WEST TROY**. See **WATERVLIEET** in SUPP.

**WEST VIRGINIA**. See **VIRGINIA** (WEST).

**WESTWARD HO**, a village and watering-place of England, on the coast of Devonshire, on Barnstaple Bay, 2½ miles north-west of Bideford. There is a United Service College for the sons of navy and army officers, and the village has fine golf links, swimming-baths, and other attractions characteristic of popular watering-places. The climate is invigorating and mild. A remarkable pebble ridge runs parallel to the shore for some 2 miles. Westward Ho was named from Charles Kingsley's well-known novel, and is of quite recent origin.

**WETTERHORN**, a mountain of Switzerland, in the Bernese Oberland, with three peaks respectively 12,149, 12,166, and 12,107 feet high.

**WEXIÖ**, or **VEXIÖ**, a town of Sweden, near Lake Helga, some 70 miles north-west of Karlskrona. It is the seat of a bishop, and has an old cathedral, dating from the beginning of the fourteenth century, and containing the tomb of St. Siegfried. The town has been almost entirely rebuilt since the fire of 1843. Tegner, the poet, is buried in the cemetery. Pop. (1900), 7365.

**WEYBRIDGE**, an urban district of England, in Surrey, on the right bank of the Thames, at the confluence of the Wey, 11 miles N.N.E. of Guildford, with several places of worship, a village hall, remains of a palace of Henry VIII., seed-crushing mills, &c. Pop. (1891), 3944; (1901), 5329.

**WEYMAN**, **STANLEY JOHN**, novelist, was born

at Ludlow on August 7, 1855. He was educated at Shrewsbury school and Christ Church, Oxford, from which he graduated B.A. in 1877. He then devoted himself to the study of law, being called to the bar in 1881, and for nine years he practised on the Oxford circuit. He began his literary career in 1890 by publishing a romance entitled *The House of the Wolf*, the scene being France at the period of Bartholomew's Eve. The New Rector followed soon after, and in 1891 *The Story of Francis Cludde* was published; but it was his brilliant story of the French Huguenots, *A Gentleman of France* (1893), that first brought him into prominence, and it is on his historical novels that his reputation rests. Since then he has published: *Under the Red Robe* (1894); *My Lady Rotha* (1894); *The Red Cockade* (1895); *The Man in Black* (1896); *Shrewsbury* (1897); *The Castle Inn* (1899); *Sophia* (1900); and *Count Hannibal* (1901). His tales are well constructed and written in a workmanlike manner, with plenty of incident and adventure, and the interest is well sustained.

**WEYMOUTH**, a town of the United States, in Norfolk county, Massachusetts, on the Weymouth Fore river, 12 miles south-east of Boston. It has manufactures of boots and shoes, fireworks, hammocks, and phosphates. Pop. (1900), 11,324.

**WHAMPOA**, or **HWAMPOA**, a port of China, on an island of the same name, 8 miles below Canton, with commodious docks. It is an outpost of Canton.

**WHEAT-EEL**, a disease in wheat which is otherwise known as *ear-cockle* and *purples* (which see).

**WHEEL-ANIMAL**, **WHEEL-ANIMALCULE**. See **ROTIFERA**.

**WHICKHAM**, a town of England, in Durham, 3 miles w.s.w. of Gateshead, with an ancient church (restored), some chapels, steel-works, chemical-works, saw-mills, a paper-mill, &c. Pop. (1891), 9343; (1901), 12,851.

**WHITCHURCH**, a market-town of England, in Shropshire, 10 miles south-west of Nantwich, with an interesting church and other places of worship, a town-hall, a grammar-school founded in the sixteenth century, an endowed girls' school, a working-men's hall, public baths, a cottage hospital, Jubilee Park, brewing, malting, cheese-making, &c. Pop. (1891), 4930; (1901), 5219.

**WHITLEY**, a watering-place of England, on the Northumberland coast, 2 miles n.n.w. of Tyne-mouth, with a church and chapels, the North Shields water-works, a free library, a convalescent home and village homes. Pop. (1891), 3008; (1901), 7705.

**WHITNEY**, **WILLIAM DWIGHT**, American philologist, was born at Northampton, Massachusetts, on Feb. 9, 1827, and after graduating at Williams College, Williamstown, in 1845, entered a banking house in his native town. He studied at Yale in 1849-50, and then went to Germany, where he continued his philological and Sanskrit studies under Bopp at Berlin and Roth at Tübingen. He was appointed to the professorship of Sanskrit at Yale in 1854, and in 1870 he received in addition the chair of comparative philology. He retained these posts till his death, which occurred at New Haven on June 9, 1894. In 1856 he published, in collaboration with Roth, an edition of the *Atharva-Veda Sanhita*, and in 1862 he issued at New Haven an edition, with translation and notes, of the *Atharva-Veda Prâtisākhya*. His *Language and the Study of Language* (1867) was an admirable exposition of the main principles of comparative philology. His other published works include: *A Compendious German Grammar* (1869); *A German*

*Reader* (1869); an edition of the *Taittiriya-Prâtisākhya* (1872), for which he was awarded the Bopp medal of the Berlin Academy; *Oriental and Linguistic Studies* (1872); a second series of studies (1874); *The Life and Growth of Language* (1875); *Essentials of English Grammar* (1877); *A Sanskrit Grammar* (1879), certainly the best yet published; *The Roots, Verb Forms, and Primary Derivatives of the Sanskrit Language* (1885), a supplement to the grammar; *A Practical French Grammar* (1886); &c. He was a contributor to Böhtlingk and Roth's great *Sanskrit Dictionary* (seven vols., 1853-75) and editor-in-chief of *The Century Dictionary of the English Language* (six vols., 1889-91). Professor Whitney received many distinctions both in his own country and from foreign countries.

**WHITTIER**, **JOHN GREENLEAF**, American poet, son of Quaker parents, and himself a Quaker, was born at Haverhill, Massachusetts, on Dec. 17, 1807. He worked on his father's farm and received but little formal education, though he contrived by working at shoemaking and teaching to pay for two periods of six months at Haverhill Academy in 1827-28. The acceptance of a poem from him in 1826 for the Newburyport Free Press led to a lifelong friendship with its editor, W. Lloyd Garrison. He edited the *American Manufacturer* in Boston in 1829, and in the following year he was editor of the *Haverhill Gazette*. During 1830-32 he conducted the *New England Review* at Hartford, Conn., and to this time belong his first independent publications, *Legends of New England* (1831) and *Moll Pitcher* (1832). In 1833 he issued an anti-slavery pamphlet, and acted as secretary of the anti-slavery convention at Philadelphia. He sat in the Massachusetts legislature in 1835, and in the following year he sold his farm and removed to Amesbury, some 10 miles north of Haverhill, where he chiefly resided for the rest of his life. He became a secretary of the Anti-Slavery Society in 1836, and in 1837 there appeared a volume of his abolitionist poems. He edited the *Pennsylvania Freeman* in Philadelphia during 1838-40, and in the first of these years his office was sacked and burned by a mob. In 1844-45 he edited the *Middlesex Standard* in Lowell, and during 1847-60 he was corresponding editor of the *National Era*, a Washington paper. He also contributed to the *Atlantic Monthly* from its foundation in 1857. His poem, *A Word for the Hour* (Jan., 1861), shows that he shrank from the Civil War and was prepared to let the southern states secede. He hailed the end of the war and of slavery with delight, and did his utmost to get the North to welcome back the South in the most generous spirit. He died, unmarried, at Hampton Falls, in New Hampshire, on Sept. 7, 1892. His publications, after those above mentioned, include the following: *Mogg Megone* (1836); *Ballads* (1838); *Lays of My Home*, and other Poems (1843); *The Stranger in Lowell* (1845), a series of prose essays; *Supernaturalism in New England* (1847), a prose work; *Leaves from Margaret Smith's Journal* (1849), an imaginative description of early New England; *Voices of Freedom* (1849), anti-slavery poems; *Old Portraits and Modern Sketches* (1850), consisting of ten biographies; *Songs of Labor*, and other Poems (1850); *The Chapel of the Hermits*, and other Poems (1853); *A Sabbath Scene: a Sketch of Slavery in Verse* (1853); *Literary Recreations and Miscellanies* (1854); *The Panorama*, and other Poems (1856); *Home Ballads, Poems, and Lyrics* (1860); *In War Time*, and other Poems (1863); *National Lyrics* (1865); *Snow-bound: a Winter Idyl* (1866), an admirable picture of his father's homestead in winter; *Prose Works* (two vols., 1866); *The Tent on the Beach*, and other Poems (1867); *Among the Hills*,

and other Poems (1869); *Miriam, and other Poems* (1871); *The Pennsylvania Pilgrim, and other Poems* (1872); *Hazel Blossoms* (1874), including poems by his sister; *Mabel Martin: a Harvest Idyl* (1875); *Centennial Hymn* (1876); *The Vision of Echard, and other Poems* (1878); *The King's Missive, and other Poems* (1881); *The Bay of Seven Islands, and other Poems* (1883); *Poems of Nature* (1886); *St. Gregory's Guest, and Recent Poems* (1886); and *At Sundown* (1892), a posthumous volume. The Riverside edition of his works, both in prose and in verse, carefully revised and annotated by himself, appeared at Boston in 1888 (seven vols.). The best and most complete American edition of the poems is the Cambridge edition (1895), and the chief British one is the Oxford one-volume edition of 1898, edited by W. G. Horder. Whittier's poems have many obvious technical defects, and are not infrequently harsh in expression and loose in thought, but their simplicity and sincerity more than atone for these deficiencies. It is in his subjective and religious poems that we find him at his best. See the *Life and Letters* (two vols., 1894) by S. T. Packard.

**WHITWORTH**, a populous village in Lancashire, England, about 3 miles north of Rochdale, with extensive cotton-mills. Pop. (1891), 9766; (1901), 9578.

**WHOOPING-COUGH**. See **HOOPING-COUGH**.

**WHYDAH**, a town of West Africa, in the kingdom of Dahomey, on the Bight of Benin, some 70 miles to the south of Abomey. It is situated close to a lagoon, and carries on a considerable trade in palm-oil. Pop. about 12,000.

**WICKHAM**, a town of Australia, in New South Wales, 1 mile from Newcastle, of which it is a suburb. Pop. (1901), 7752.

**WIENER-NEUSTADT**, a town of Austria, on the Fischa, 30 miles south by west of Vienna, with which it has canal and railway communication. It was almost entirely destroyed by fire in 1834, but a number of interesting mediæval buildings yet remain. Chief among these is the castle, now used as a military academy. There are important manufactures of locomotives, machinery, pottery, leather, &c. Pop. (1890), 25,040; (1900), 28,438.

**WIGSTON MAGNA**, a town of England, in Leicestershire, 3 miles south by east of Leicester, with two ancient churches, several nonconformist chapels, a working-men's club and institute, hosiery manufactures, railway sheds (Midland), &c. Pop. (1891), 6916; (1901), 8404.

**WILBERFORCE, SAMUEL**, English prelate, third son of William Wilberforce the philanthropist, was born at Clapham on Sept. 7, 1805. After a private education he graduated as B.A. from Oriel College, Oxford, in 1826, gaining great distinction in mathematics and classics. Ordained deacon in 1828, he was appointed curate of Checkendon, in Oxfordshire, in the same year, and from 1830 till 1840 he was rector of Brighthelm, in the Isle of Wight. In 1836 he was appointed to the rural deanery of the northern part of the Isle of Wight, three years later he became archdeacon of Surrey, and in 1840 he was promoted to the canonry of Westminster. In the latter year also he became rector of Alverstoke, Hampshire. The deanery of Westminster was conferred on him in 1845, and before the close of that year he was further promoted to the bishopric of Oxford. From 1869 till his death he was bishop of Winchester. He was the leader of the High Church party, and the author of *Note-book of a Country Clergyman* (1833); *Eucharistica* (1839); *A History of the Protestant Episcopal Church in America* (1844); a volume of *University Sermons*, and numerous other works. He was killed by a fall from his

horse on July 19, 1873. See the *Life* by his son, R. G. Wilberforce (1888).

**WILLENHALL**, a town of England, in South Staffordshire, between Wolverhampton and Walsall, and included in Wolverhampton par. bor. It has extensive manufactures of iron goods, especially locks. Pop. (1891), 16,852; (1901), 18,518.

**WILLESDEN**, an urban district of England, in Middlesex, a suburb of London, 7 miles north-west of St. Paul's. It is an important railway junction. The church of St. Mary is a building of considerable age and in various styles of architecture. There is a public library, a cottage hospital, &c. Pop. (1891), 61,265; (1901), 114,815.

**WILLIAM II., FRIEDRICH WILHELM VICTOR ALBERT**, German emperor and King of Prussia, eldest son of Frederick III. (Prince Frederick William of Prussia) and his wife Victoria, Princess Royal of Great Britain, was born in Berlin on Jan. 27, 1859. He was educated at the gymnasium at Cassel, and afterwards studied law and political science at the University of Bonn. He left Bonn in 1879, and on Feb. 27, 1881, he married Princess Augusta Victoria of Schleswig-Holstein-Sonderburg-Augustenburg. He was called to the throne by the death of his father on June 15, 1888. Throughout his reign he has shown himself a man of great energy and wide interests, and has steadily striven, not without considerable success, to establish a personal rule, untrammelled by ministerial control. His political self-assertion brought about the retirement of Prince Bismarck in 1890. Count von Caprivi succeeded Bismarck as imperial chancellor, but resigned in October, 1894, when Prince Hohenlohe became the emperor's chief minister. Count von Bülow has been chancellor since 1901. He has personally proposed many bills to the Reichstag, some of which have been accepted, whilst others have been withdrawn. Several of these relate to the organization of the imperial army, in which he is keenly interested, and more recently to the increase of the imperial navy. Colonial expansion and commercial development have occupied much of his attention, and he has attempted at various times, though without success, to stamp out social democracy either by working-class legislation or by vigorous repressive measures. He has paid many visits to the courts of foreign rulers, and in the latter part of 1898 he visited Palestine in order to lay the foundation-stone of a Lutheran church at Jerusalem. Several of his speeches on important occasions have attracted much attention, not only in Germany but in other countries also. The Emperor William has shown himself a liberal patron of science and art. He has himself composed a song and published a collection of sermons. His yacht has competed several times at the Cowes regatta. In 1897 an edition of his speeches during 1888-95 was published under the title *Wilhelm II. als Redner*. He was present at the death-bed of his grandmother, the late Queen Victoria. The emperor has issue: Crown Prince William, born May 6, 1882; Prince Eitel Frederick, born July 7, 1883; Prince Adalbert, born July 14, 1884; Prince August William, born Jan. 29, 1887; Prince Oscar, born July 27, 1888; Prince Joachim, born Dec. 17, 1890; and Princess Victoria Louise, born Sept. 13, 1892. See *Simon's L'Empereur Guillaume II. et la première Année de son Règne* (1889) and his *Quatre Portraits* (1896); *Kaiser Wilhelm II. und seine Leute* (3rd ed., 1892); and *Charles Lowe's The German Emperor* (1895).

**WILLIAMS, SIR MONIER**. See **MONIER-WILLIAMS** in SUPP.

**WILLIMANTIC**, a city of the United States, in Windham county, Connecticut, at the junction of the Willimantic and Natchaug rivers, which here

form the Shetucket, 32 miles east by south of Hartford. There is a fine State normal school. A fall on the first-named river provides abundant water-power for manufacturing purposes. Pop. (1900), 9837.

**WILLINGTON**, a town of England, in Durham, 6 miles south-west of the town of Durham, with large collieries, stone-quarries, &c. Pop. (1891), 7804; (1901), 7887.

**WILLINGTON QUAY**, a town of England, in Northumberland, on the north bank of the Tyne, a little to the east of Wallsend, with a Stephenson Memorial Institute, engineering, ship-building, and iron works, chemical and fire-clay works, &c. It was associated with the two Stephensons. Pop. (1891), 7345; (1901), 8046.

**WILLOW-WREN**, *Sylvia trochilus*, one of the most abundant of the warblers, and a summer visitant in Britain, with a pleasing song. See **WARBLERS**.

**WILMSLOW**, a town of England, in Cheshire, on the river Bollin, 6 miles s.s.w. of Stockport, with a fine Perpendicular church, other places of worship, &c. It is largely residential. Pop. (1891) 6344; (1901), 7361.

**WILSON**, **SIR DANIEL**, archæologist, was born at Edinburgh on Jan. 5, 1816, and educated there at the High School and the University. After leaving college he entered with great earnestness into antiquarian pursuits, and published in 1847, *Memorials of Edinburgh in the Olden Time*, a work in two volumes, in which the traditions, history, and life of the old city are gathered up with great accuracy and detail. He next produced a volume on Oliver Cromwell and the Protectorate (1848). Even more important than these, however, was *The Archæology and Prehistoric Annals of Scotland*, published in 1851. At this time he was acting as secretary of the Scottish Society of Antiquaries, but in 1853 he was called to fill the chair of history and English literature in the University of Toronto. While resident in Canada he published *Prehistoric Man* (1862, revised 1876); *Chatterton, a Biographical Study* (1869); *Caliban, the Missing Link* (1873); *Spring Wild-Flowers* (1875), a volume of poems; *Reminiscences of Old Edinburgh* (1878); *Anthropology* (1885); *William Nelson, a Memoir* (1890); and *The Right Hand: Left-handedness* (1891). In 1881 he succeeded Dr. McCaul in the presidency of Toronto University, a position which he held until his death on 7th August, 1892. In recognition of his services to education and literature he was knighted in 1888.

**WILSON**, **SIR WILLIAM JAMES ERASMUS**, an eminent surgeon and munificent public benefactor, was born in London, 25th November, 1809. His father, an Aberdeenshire surgeon, served in the Royal Navy till the Peace of Paris in 1815, when he settled in private practice at Dartford, in Kent. Young Wilson was educated at Dartford and Swanscombe and entered Abernethy's anatomical class in his sixteenth year. He afterwards went through a course of hospital practice in Paris, where he became known to Cuvier and Geoffroy de St. Hilaire. Later he attached himself to the Aldersgate School of Medicine, and after passing the examination of the College of Surgeons he was engaged in 1831 as assistant to Dr. Quain, professor of anatomy in University College. His first work, *Practical and Surgical Anatomy*, was published in 1838, and followed in 1840 by the *Anatomist's Vade Mecum*. About this time he determined to devote himself to dermatology, and soon became the acknowledged authority in that hitherto obscure branch of medical science. He became Fellow of the Royal College of Surgeons in 1843, one of the

council in 1870, and president in 1871. In 1845 he was elected a fellow of the Royal Society. By the time he had reached his fiftieth year he had amassed considerable wealth, when he commenced a splendid series of public and private acts of munificence by founding a professorship of dermatology in the College of Surgeons, the chair of which he filled for nine years. He contributed £7000 to Epsom Medical College, restored the ancient church of Swanscombe, in Kent, founded a chair of pathology at Aberdeen at the cost of £10,000, subscribed £2500 to the Royal College of Music, and upwards of £30,000 to the Margate Sea-bathing Infirmary. His private charities were also distributed on a lavish scale. He latterly devoted much attention to Egyptology, and was president of the Egypt Exploration Fund, contributing £1500 to the first year's work. He also furnished £10,000 for the transport of the famous obelisk known as 'Cleopatra's Needle' from Alexandria to its present site on the Thames Embankment. In 1881 he received the honour of knighthood, and was the recipient of the rarely bestowed Royal College of Surgeons' gold medal. Besides many publications in his special science he published, *Cleopatra's Needle with Notes on Egypt and Egyptian Obelisks*, and *The Egypt of the Past*. He died at Westgate-on-Sea, 8th August, 1884.

**WIMBORNE MINSTER**, or **WIMBORNE**, a market-town in Dorsetshire, England, on the river Allen (or Wim), near its confluence with the Stour, about 6½ miles north-west of Bournemouth. The principal building is the minster, a fine cruciform structure in various styles of architecture from the Norman onwards. Pop. (1891), 3652; (1901), 3696.

**WINCEY**, a strong and durable cloth, plain or twilled, composed of a cotton warp and a woollen weft. Heavy winceys have been much worn as skirtings and petticoats.

**WINDERMERE**, a town of England, in Westmorland, near the eastern shore of the lake of the same name, 8 miles north-west of Kendal, with which it is connected by a branch railway line. It has an ancient church of some interest, an old rectory house, a seventeenth-century grammar-school, &c. Pop. (1891), 2252; (1901), 2379.

**WINONA**, a city of the United States, capital of Winona county, Minnesota, beautifully situated on the west bank of the Mississippi, on a plain between the river and Lake Winona, 104 miles south-east of St. Paul. The river is here crossed by three bridges, two of them railway ones. Among noteworthy buildings are the United States government building (1890); the State normal school; the high-school; the public library; the opera-house; and many churches. It is a flourishing place and an important centre of trade and manufactures. The trade is mainly in the agricultural and other produce of the surrounding country. The scenery around Winona is very beautiful. Pop. (1890), 18,208; (1900), 19,714.

**WINTER-CRESS**, the common name of two British cruciferous plants of the genus *Barbarea*. *B. vulgaris*, called also *yellow rocket*, grows on the banks of ditches and rivers, and about hedges and walls. It is bitter and sharp to the taste, and is sometimes used as a salad.

**WINTER'S-BARK** (*Drimys Winteri*), a plant of the natural order Magnoliaceæ, a native of Western America from Mexico to Cape Horn. It is an evergreen shrub, the bark of which has an agreeable, pungent, aromatic taste, and tonic properties. Various substitutes also bear this name.

**WITHAM**, a town of England, in Essex, on the river Blackwater, 8 miles north-east of Chelmsford,

with an ancient church, modern churches and chapels, a public hall, literary institution, almshouses, &c. Pop. (1891), 3444; (1901), 3454.

**WITHINGTON**, a town of England, in Lancashire, 3 miles south of the centre of Manchester, in the parliamentary borough of which it is partly included. It contains modern churches and chapels, Lancashire Independent College, a public hall and library, and numerous residential villas. Pop. (1891), 25,729; (1901), 36,201.

**WIVENHOE**, a town of England, in Essex, at the head of the Colne estuary, 3 miles south-east of Colchester, with an old church, other places of worship, ship-building, oyster-fishing, &c. Pop. (1891), 2441; (1901), 2560.

**WOBURN**, a city of the United States, in Middlesex county, Massachusetts, 10 miles N.W. of Boston. It contains a high-school; academy; free library, in a fine building; various churches; an efficient tramway system, &c. The principal industry is the manufacture of leather; and there are, besides, chemical-works and other industrial establishments. Pop. (1890), 13,499; (1900), 14,254.

**WOLSELEY**, SIR GARNET JOSEPH, VISCOUNT, British field-marshal, son of a major in the army, was born near Dublin on June 4, 1833. After receiving a private education he entered the army in 1852 as an ensign, and was promoted to the rank of lieutenant in the following year. He served with the 80th Regiment of Foot in the Burmese War of 1852-53 under Sir Henry T. Godwin, and received his first medal. He went through the Crimean campaign with the 90th Foot and was severely wounded before Sebastopol. For his services here he was made a member of the Legion of Honour and received the fifth class of the Turkish order of the Medjidieh, and in 1855 he was advanced to the rank of captain. He next saw active service in India during the mutiny, and was mentioned in despatches for his bravery and skill in the siege of Lucknow and the defence of Alumbagh. From 1858 to 1860 he was attached to the Bengal command, and during that period he was advanced two more grades, becoming major of the 90th in 1858 and lieutenant-colonel in 1859. He took part in the brief China War of 1860, for which he received a medal with two clasps, and in 1865 he attained the rank of colonel. He was assistant quartermaster-general and deputy quartermaster-general in Canada during 1867-70, and in the latter year he led the successful Red River expedition against Louis Riel. Meanwhile, in 1868, he was promoted major-general, and on leaving Canada he received the appointment of assistant adjutant-general at head-quarters, a post which he held till 1873. The first noteworthy campaign in which he had supreme command was that against the Ashantis in 1873-74, and an admirably planned march soon resulted in the capture of Kumasi, the native capital, and so led to the securing of British authority on the Gold Coast. For his services here he received the thanks of parliament and a gift of £25,000, was made a G.C.M.G. (he had been a K.C.M.G. since 1870) and a K.C.B., and had the freedom of the city of London conferred upon him. In 1875 he went to Natal as imperial commissioner. He discharged the important duties of inspector-general of auxiliary forces in 1874-76, and from 1876 to 1878 was a member of the Indian Council. In 1878 he was promoted to the rank of lieutenant-general, and went to Cyprus in the capacity of high commissioner and commander-in-chief. Leaving Cyprus next year he was again sent to South Africa, this time as governor and high commissioner of Natal and the Transvaal in order to finish the Zulu war and check

the advance of Secocoeni. On returning home in 1880 he was created G.C.B. and was appointed quartermaster-general of the army, a post which he held till 1882, when he entered on his eight years' adjutant-generalship to the forces. In 1882 he was advanced to the rank of general, and as commander-in-chief conducted the campaign in Egypt against Arabi Pasha, which ended in the utter defeat of the latter at Tel-el-Kebir. For this he was raised to the peerage as Baron Wolseley of Cairo and of Wolseley, in the county of Stafford. He commanded the Nile expedition of 1884-85, which was sent too late to relieve General Gordon in Khartum, and on his return was created Viscount Wolseley of Wolseley, and made a Knight of the Order of St. Patrick. In 1890 he was appointed to the command of the forces in Ireland, becoming at the same time a privy-councillor of Ireland, and in 1895 he succeeded the Duke of Cambridge in the post of commander-in-chief in the United Kingdom. He was succeeded in the latter post by Lord Roberts, who took up the duties on his return from South Africa in 1900. Lord Wolseley received his field-marshal's baton in 1894. His peerage will descend, by special remainder, to his only daughter. He has published the following works: *Narrative of the War with China in 1860* (1862); *The Soldier's Pocket-Book for Field Service* (1869; several later eds.); *The Life of John Churchill, Duke of Marlborough, to the Accession of Queen Anne* (two vols., 1894); and *The Decline and Fall of Napoleon* (1895).

**WOMBWELL**, a town in the West Riding of Yorkshire, about 5 miles south-east of Barnsley, with extensive coal-mines in the neighbourhood. Pop. (1891), 10,942; (1901), 13,252.

**WONSAN**, a treaty-port of Corea, on the east coast, on Broughton Bay, 115 miles north by east of Söul. A gold-mine is worked here. Pop. 15,000.

**WOO-CHANG**, a city of China, province of Hu-Pé, on the Yang-tse-kiang, opposite the city of Hankow. The latter is in effect but a suburb of Woo-Chang, another portion on the north bank of the river being Han-Yang. It is the great emporium for the tea exported by way of Shanghai. Pop. variously estimated from 1,000,000 upwards.

**WOOD**, ELLLEN, or PRICE, English novelist, better known as Mrs. Henry Wood, was born at Worcester on Jan. 17, 1814, and died in London on Feb. 10, 1887. In 1836 she married Henry Wood, a member of a banking and shipping firm, and from then till 1856 she lived in France. Among her many novels may be noted *East Lynne* (1861), which has had an enormous success both as a book and a drama; *Mrs. Halliburton's Troubles* (1862); *The Channings* (1862); *The Shadow of Ashlydyat* (1863); *Lord Oakburn's Daughters* (1864); *St. Martin's Eve* (1866); *A Life's Secret* (1867); *Anne Hereford* (1868); *Roland Yorke* (1869), a continuation of *The Channings*; *Dene Hollow* (1871); *Within the Maze* (1872); *Bessy Walls* (1875); *Edina* (1876); *Pomeroy Abbey* (1878); *Court Netherleigh* (1881); *About Ourselves* (1883); *Lady Grace* (1887); *The Story of Charles Strange* (1888); *The House of Halliwell* (1890); *Summer Stories from the Argosy* (1890); *The Unholy Wish* (1890); *Ashley and other Stories* (1897); and the *Johnnie Ludlow Stories* (1874-80; two series), like several of her other works reprinted from the *Argosy*, of which she was long editor. See the *Memorials* by her son (1894).

**WOOD**, SIR EVELYN, British general, was born on Feb. 9, 1838, at Cressing, Essex, where his father, the Rev. Sir John Page Wood, was vicar. He was educated at Marlborough College and joined the navy in 1852. During the Crimean war he served

as aide-de-camp to Sir William Peel, who was in command of the Naval Brigade, and on June 18, 1855, he was severely wounded while carrying a scaling ladder to the Redan. On his return from this campaign he was made a knight of the Legion of Honour, besides receiving several Turkish honours. In 1855 he entered the army as cornet in the 13th Dragoons, becoming lieutenant in the following year. In 1858 he served in India with the 17th Lancers as a brigade-major and highly distinguished himself in several engagements. He was twice mentioned in despatches and received the thanks of the Indian government, and he also gained the Victoria Cross for conspicuous valour. In 1873 he served under Sir Garnet Wolseley in the Ashantee war, being then lieutenant-colonel in the 90th infantry. On his return from this campaign he was called to the bar at the Middle Temple (1874). He served in the Zulu war of 1879 and highly distinguished himself throughout, being promoted to the rank of brigadier-general after his victory at Kambula. On his return to England he was created K.C.B. and was presented with a sword of honour by his native county. He was second in command of the British forces in the brief Transvaal war of 1881, and on the conclusion of peace he discharged certain administrative functions there. In 1882 he was created G.C.M.G. and appointed to the command of the Chatham district, and towards the end of the same year he went to Egypt as commander-in-chief or sirdar. In 1884-85 he commanded the line of communications in the Nile expedition, but since 1886 he has held only home appointments. From 1886 till 1889 he was in command of the Eastern district, and in 1889-93 of the Aldershot district. In 1893 he became quartermaster-general to the forces, and held that position till his appointment in 1897 to the office of adjutant-general to the forces. In 1901 he was placed in command of the second army corps with head-quarters on Salisbury Plain. He was awarded the Grand Cross of the Bath in 1891. Sir Evelyn Wood is known as an author by his works on *The Crimea in 1854-94*; *Cavalry at Waterloo*; and *Cavalry Achievements*. See the *Life* by Charles Williams (1892).

WOOD, REV. JOHN GEORGE, naturalist, was born in London on July 21, 1827. From 1838 till 1844 he was educated under his uncle at Ashbourne grammar-school, from which he proceeded to Merton College, Oxford, graduating B.A. in 1848. Ordained deacon in 1852, he became curate of St. Thomas the Martyr, Oxford, but he resigned in 1854 after receiving priest's orders. In 1856-62 he was chaplain to St. Bartholomew's Hospital, and in 1858-63 he was a reader at Christ Church, Newgate Street, but he resigned both these posts on account of ill-health. For seven years from 1869 he conducted the festivals of the Canterbury Diocesan Choral Union. During 1879-88 he delivered numerous lectures on natural history in Britain and America. He died at Coventry on March 3, 1889. His numerous works contributed very greatly to popularize natural history. Among them are: *The Illustrated Natural History* (1851); *Bees* (1853); *Common Objects of the Sea-Shore* (1857); *Common Objects of the Country* (1858); *Routledge's Illustrated Natural History* (1859-63, 3 vols.—his most important work); *Common Objects of the Microscope* (1861); *Our Garden Friends and Foes* (1863); *Homes without Hands* (1864-65); *Common Shells of the Sea-Shore* (1865); *Fresh and Salt Water Aquarium* (1868); *Natural History of Man* (1868-70); *Bible Animals* (1869-71); *Common Moths of England* (1870); *Common British Beetles* (1870); *Insects at Home* (1871-72); *Insects Abroad* (1874);

*Man and Beast: Here and Hereafter* (1874); *Field Naturalist's Handbook* (1879-80); *Common British Insects* (1882); *Half-Hours in Field and Forest* (1884); *Half-Hours with a Naturalist* (1885); *Romance of Animal Life* (1887); together with books on athletics, Bible history, &c., and editions of White's *Selborne*, Waterton's *South America*, &c. See *Life* by his son (1890).

WOODFORD, a town of England, in Essex, practically a residential suburb of London, 8 miles north-east of St. Paul's, with a convalescent home, an art and industrial society, &c. Pop. (1891), 11,024; (1901), 13,806.

WOOD GREEN, an urban district of England, in Middlesex, 6 miles north of St. Paul's, with a town-hall, a masonic institution, and a masonic hall, assembly-rooms, numerous alms-houses, &c. Pop. (1891), 25,881; (1901), 34,188.

WOODRUFF, WOODROOF, the common name of plants of the genus *Asperula*, belonging to the natural order Rubiaceæ. The sweet woodruff (*A. odorata*), with its whorled leaves and white blossom, is found plentifully in Britain in woods and shady places. The dried leaves are used to scent clothes and also to preserve them from the attacks of insects. The root of the dyer's woodruff (*A. tinctoria*) is used instead of madder.

WOOD-SORREL, the common name of the plant *Oxalis Acetosella*, well known for the acidity of its leaves, and formerly used in medical practice as an antiscorbutic and a refrigerant. See OXALIDACEÆ, OXALIC ACID.

WOOLNER, THOMAS, R.A., sculptor, was born at Hadleigh, Suffolk, on 17th December, 1825. At the age of twelve he was placed in the studio of William Behnes, under whose instruction he became a skilful sculptor. In 1842 he entered the schools of the Royal Academy, and in the following year his first work, *Eleanor sucking the Poison from the Arm of Prince Edward*, was exhibited. His first work which attracted attention was *The Death of Boadicea*, exhibited in Westminster Hall in 1844; and this success was followed by *Alastor* (1846), *Puck* (1847), *Titania and Her Indian Boy* (1848), and *Eros and Euphrosyne* (1848). About 1850 he was associated with D. G. Rossetti and the other artists who formed the 'Pre-Raphaelite Brotherhood' in founding a short-lived periodical called *The Germ*. His contributions, which were in poetry, were afterwards collected and published, with additions, under the name of *My Beautiful Lady* (1863). He visited Australia in 1852, and one of his first works on his return was a life-size statue of Lord Bacon for the new museum at Oxford. His more important works of sculpture include: *Elaine with the Shield of Sir Lancelot*, *Ophelia*, in *Memoriam* (1870), *Guinevere* (1872), *Achilles and Pallas shouting from the Trenches* (1876), *Lady Godiva* (1876), and *The Housemaid* (1892), while the busts which he executed comprise, among others: *Carlyle*, *Tennyson*, *Darwin*, *Newman*, *Gladstone*, *Kingsley*, and *Dickens*, besides statues of *Lord Macaulay* for *Trinity College, Cambridge* (1866), *Sir Bartle Frere* for *Bombay* (1872), *Dr. Whewell* for *Trinity College, Cambridge* (1873), *Lord Lawrence* for *Calcutta* (1875), *J. S. Mill* for the *Thames Embankment* (1878), *Captain Cook* for *Sydney* (1879), *Sir Stamford Raffles* for *Singapore* (1887), and *Lord Palmerston* for *Palace Yard*. He became an A.R.A. in 1871, an R.A. in 1874, and for a time he was professor of sculpture in the Academy. His death occurred on 7th October, 1892. Besides the volume of poetry already mentioned, he published *Pygmalion* (1881), *Silenus* (1884), *Tiresias* (1886), and *Poems* (1887).



**WOONSOCKET**, a city of the United States, in Providence county, Rhode Island, on both banks of the Blackstone river, here crossed by a splendid bridge, 16 miles north by west of Providence, and 37 miles south-west of Boston by rail. It contains the Harris Institute, with a valuable free library; a high-school and a number of common schools; two opera-houses and several public halls. The town has extensive manufacturing establishments, the chief of which are cotton and woollen factories, machine-shops, rubber-works, planing-mills, &c. Pop. (1880), 16,050; (1900), 28,204.

**WORCESTER**, a town of Cape Colony, 60 miles north-east of Cape Town, but 109 miles by the railway through Paarl and Tulbagh. The town is regularly laid out, the streets being planted with trees. It is well supplied with water from the Hex River. The vine is extensively cultivated in the neighbourhood, and brandy and wine are made in considerable quantity. Pop. (1891), 5404.

**WORDSWORTH**. Various members of this family besides the poet have highly distinguished themselves, especially in classical scholarship and theology. His sister **DOROTHY** (born in 1771), mentioned in the article in the body of the book as her brother's household companion, was a woman of remarkable mental powers, and had an acknowledged influence for good on his earlier poetic work in particular. Besides her *Recollections of the Scottish tour*, other journals and letters of hers have been published. Her mind was latterly clouded, but she outlived the poet, dying in 1855. See *Lee's Dorothy Wordsworth* (1886).—**CHRISTOPHER WORDSWORTH**, his youngest brother, born at Cockerham on June 9, 1774, was educated at Hawkshead grammar-school, and Trinity College, Cambridge. He graduated as tenth wrangler in 1796, and was elected a fellow of his college in 1798. He held various livings in the Church, and was Master of Trinity College from 1820 to 1841. He published *Ecclesiastical Biography* (1810); *Sermons on various Subjects* (1814); *Christian Institutes*, a series of discourses and tracts (1836); &c. He died in 1846.—The eldest son of Christopher, **JOHN WORDSWORTH** (1805-39), was a distinguished classical scholar.—Christopher Wordsworth's second son, **CHARLES**, bishop of St. Andrews, was born at Lambeth, 22nd August, 1806, and was educated at Harrow and Christ Church, Oxford. Here he distinguished himself both as a classical scholar (graduating with first-class honours in 1830), and also as a cricket player and oarsman. Becoming a private tutor, he had Gladstone and Manning as pupils. From 1835 to 1846 he was second master at Winchester School, from the latter year to 1854 he was (first) warden of Trinity College, Glenalmond (Perthshire), a school in connection with the Scotch Episcopal Church. He was elected Bishop of St. Andrews, Dunkeld, and Dunblane in 1852, and continued to exercise the episcopal office till his death, which occurred at St. Andrews on 5th December, 1892. He became a prominent figure in the ecclesiastical life of Scotland, the desire that lay nearest his heart being to heal the dissensions between the different churches, and to pave the way for their reunion. Besides volumes of sermons, discourses, &c., he produced various works, the earliest being a widely used Greek Grammar (written in Latin), which first appeared in 1839, while one of the best known is his *Shakspeare's Knowledge and Use of the Bible* (4th edition, 1892), and one of the most interesting his *Annals of My Early Life* (vol. i., 1891). See also *Annals of My Life* (1893), edited by W. E. Hodgson; and the *Episcopate of Charles Wordsworth* (1899), by John Wordsworth (noticed below).—The bishop's

younger brother, **CHRISTOPHER**, born at Lambeth on Oct. 30, 1807, was educated at Winchester and at Trinity College, Cambridge, where, after a brilliant career, he graduated as senior classic in 1830, was elected fellow, and in 1836 public orator. From 1836 to 1844 he was head-master of Harrow School; he then became canon of Westminster, and after being archdeacon of Westminster he was appointed to the bishopric of Lincoln in 1868. He died at Harewood, Yorks, March 21, 1885. He was the author of a number of writings connected with classical, theological, or ecclesiastical subjects, among which we shall particularize only *Athens and Attica* (1836); *Greece: Pictorial, Descriptive, and Historical* (1839; these works being based on the author's personal observation); *The Correspondence of Richard Bentley* (1842), begun by Dr. Monk and his brother John, and completed by him; an edition of *Theocritus* (1844; fuller one, 1877); *Memoirs of William Wordsworth* (1851); *S. Hippolytus and the Church of Rome in the Third Century* (1853); *The New Testament in the Original Greek* (1856-60); *The Old Testament in the Authorized Version, with notes and introductions* (six vols., 1864-71); and *A Church History to the Council of Chalcedon, 451 A.D.* (four vols., 1881-83). See the *Life* by his daughter Elizabeth, first principal of Lady Margaret Hall, Oxford, and J. H. Overton (1888).—The eldest son of the preceding, **JOHN WORDSWORTH**, born at Harrow on Sept. 21, 1843, was educated at Ipswich, Winchester School, and New College, Oxford, graduating with honours in classics in 1865. He was ordained deacon in 1867, and in that year also he was elected fellow of Brasenose College. In 1866 he became an assistant master in Wellington College, in 1870 prebendary of Lincoln, and during 1883-85 he was Oriel professor of the interpretation of Holy Scripture, Fellow of Oriel College, and Canon of Rochester. He was select preacher at Oxford in 1876 and 1888, and Bampton lecturer in 1881. In 1885 he succeeded Dr. Moberly in the episcopal see of Salisbury. His chief publications are: *Lectures Introductory to a History of Latin Literature* (1870); *Fragments and Specimens of Early Latin* (1874); *University Sermons on Gospel Subjects* (1878); *The One Religion, or Truth, Holiness, and Peace, desired by the Nations and revealed by Jesus Christ* (1881, Bampton Lectures); *Old Latin Biblical Texts* (two parts, 1883-86), in collaboration with Prof. Sanday and Rev. H. J. White; *The Holy Communion* (1891); *Novum Testamentum Latine, secundum editionem S. Hieronymi* (*The Four Gospels*, 1898), in which he had the assistance of H. J. White; *The Episcopate of Charles Wordsworth* (1899); *Teaching of the Church of England for Information of Eastern Christians* (1900), including a Greek translation by John Gennadius; and *The Ministry of Grace* (1901).—The second son of the Bishop of Lincoln, **CHRISTOPHER WORDSWORTH**, born at Westminster on March 26, 1848, was educated at Winchester School and Trinity College, Cambridge, where he graduated in 1871. In 1870-77 he was a fellow and tutor of Peterhouse, and in 1877 he was appointed rector of Galston, in Rutland. In 1886 he became a prebendary of Lincoln cathedral, and in 1889 rector of Tyneham, Dorset. Since 1897 he has been rector of St. Peter's, Marlborough. His published works comprise: *University Society in the Eighteenth Century* (1874); *Scholæ Academicæ* (1877); *Breviarium ad Usum Sarum* (three vols., 1879-86), edited in collaboration with F. Procter; *Pontificale Ecclesiæ S. Andrewæ* (edited, 1885); *Lincoln Cathedral Statutes* (three vols., 1892-97), edited with the assistance of H. Bradshaw; *Coronation of King*

Charles I. (1892-94); Mediæval Services (1898); &c.

**WORM-SEED**, a seed which has the property of expelling worms from the intestinal canal. It is brought from the Levant, and is the produce of a species of *Artemisia* (*A. Santonica*), which is a native of Tartary and Persia. In the United States the name is generally given to the seed of *Chenopodium anthelminticum*. The treacle-mustards (*Erysimum*) also receive this name. See **SANTONIN** and **ERYSIMUM** in SUPP.

**WORSBOROUGH**, a town of England, in Yorkshire (West Riding), 10 miles north of Sheffield, with an Early English church (restored), a modern church and several chapels, collieries, steel-works, gunpowder-mills, &c. Pop. (1891), 9905; (1901), 10,335.

**WORSLEY**, a town of England, in Lancashire, 5 miles west by north of Manchester, on the Bridgewater Canal, with collieries and cotton-factories. Pop. (1891), 10,992; (1901), 12,448.

**WURZEN**, an old town of Germany, in Saxony, on the Mulde, here crossed by a railway bridge and a foot-bridge, 60 miles north-west of Dresden. It has a cathedral of the twelfth century, with two towers, restored throughout in 1817-18; an ancient castle; a royal gymnasium; many other educational institutions; a municipal hospital; &c. The industries include iron-founding and the manufacture of machinery, paper, carpets, furniture, cigars, &c. Wurzen was twice burned by the Swedes during the Thirty Years' War. Pop. (1895), 15,674; (1900), 16,615.

## Y.

**YABLONOI**. See **STANOVOI MOUNTAINS**.

**YAKOBA**, a town of West Africa, in Northern Nigeria, finely situated on a plateau partly surrounded by mountains, 140 miles south-east of Kano. It is walled, and the interior is finely diversified with gardens and ponds. The climate is healthy. Pop. 50,000.

**YAKUB KHAN**. See **AFGHANISTAN**.

**YAMAGATA**, a town of Japan, in the island of Hondo, 200 miles north of Tokio. Pop. (1899), 35,300.

**YANKTON**, a city of the United States, capital of Yankton county, South Dakota, on the north bank of the Missouri, 980 miles above its junction with the Mississippi. It is a well-laid-out town, connected by steamers with all the ports on the Missouri, and carries on a large trade. Here are Yankton College, the Academy of the Sacred Heart, and the State Insane Asylum. Pop. (1900), 4125.

**YARMOUTH**, a seaport town of Nova Scotia, at the entrance to the Bay of Fundy, 205 miles south-west of Halifax, and the chief ship-building place in the province. Pop. (1891), 6089; (1901), 6430.

**YASS**, a town of New South Wales, on the river Yass, about 190 miles south-west of Sydney, with which it is connected by the Great Southern Railway. There is one principal street, crossed by others at right angles, and the public edifices include court-house, handsome public school, mechanics' institute and library, guildhall, &c., besides churches. A handsome iron lattice-bridge crosses the river to North Yass, and there is a steel railway bridge. Yass has been proposed as the seat of government of the Australian Commonwealth. Pop. 2500.

**YELLOW**, one of the prismatic colours, the colour of that part of the solar spectrum situated between the orange and the green. See **COLOUR**, **PIGMENT**, **DYEING**, **SPECTRUM**.

**YELLOW**S, an inflammation of the liver, or a kind of jaundice, which affects horses, cattle, and sheep, causing yellowness of the eyes.

**YEN**, a Japanese money unit, equal to 100 *sen*, or 1000 *rin*. Its value is about two shillings. See **MONEY** in SUPP.

**YOLA**, a town of Africa, in Northern Nigeria, capital of Adamawa, on the left bank of the Benue, 250 miles s.s.w. of Kuka. The surrounding district is very fertile and beautiful. Pop. 12,000.

**YONGE**, **CHARLOTTE MARY**, English authoress, was born at Otterbourne, in Hampshire, on Aug. 11, 1823, and received a private education. She made

her name widely known by the publication in 1853 of a novel entitled *The Heir of Redclyffe*, which exercised an important influence on some leading minds of that time. She devoted part of the proceeds to fitting out a missionary ship for Bishop Selwyn. None of her later novels came up to the standard of her first work. Among the best of them are *Katharine Ashton*; *The Daisy Chain*, the proceeds of which she devoted to founding a missionary college at Auckland, in New Zealand; *Hopes and Fears*; *The Little Duke*; *The Prince and the Page*; and *The Dove in the Eagle's Nest*. Her staunch attachment to the Church of England more or less colours all these works, and was also manifested, not only in the field of practical effort, but in the choice of the subjects of some other of her works, such as: *Biographies of Good Women* (1862); *Life of Bishop J. C. Patteson* (two vols., 1873); *John Keble's Parishes* (1898); and *The Patriots of Palestine* (1898). Her remaining works include: *Christian Names: their History and Derivation* (1863); *Cameos from English History* (nine series, 1869 to 1899); *History of Germany* (1877); *History of France* (1879); *Universal History for Young People*; &c. For thirty years she edited a High Church magazine known as *The Monthly Packet*. She died at Otterbourne on March 24, 1901.

**YONKERS**, a city of the United States, in Westchester county, New York, on an elevated and uneven site on the east bank of Hudson River, 18 miles north by east of the city hall of New York, but just outside the boundary of Greater New York. It contains many churches, a city-hall, a large number of public and private schools, a public library, &c. A great part of the city is occupied by elegant residences belonging to the business men of New York. There are extensive manufactures of mowing and reaping machines, tools, carpets, silks, hats, beer, chemicals, &c. Pop. (1890), 32,033; (1900), 47,931.

**YORK**, a city of the United States, capital of York county, Pennsylvania, on both banks of Ocodorus Creek, 48 miles north of Baltimore, and 96 west of Philadelphia. It is neatly and substantially built, and contains many handsome residences and public buildings, such as the court-house, a fine granite Grecian structure; the Collegiate Institute; various churches, and a number of excellent schools. There are foundries, railway workshops, car-factories, agricultural-implement works, &c. York is the centre of a fertile agricultural district. Pop. (1890), 20,793; (1900), 33,708.

**YORUBA**, or **YARRIBA**, a country of West Africa, situated north and north-east of the colony of Lagos. It is peopled by a number of confederated tribes, and is now attached to the colony and protectorate of Lagos. Much of the country is fertile and well cultivated, and the inhabitants have made great progress in the industrial arts. They are largely pagans, but Mohammedanism and Christianity have made way among them. Protestant and Roman Catholic missions have long been at work. Ibadan, to which there is a railway from Lagos, is the largest town, having about 200,000 inhabitants, but Oyo, farther to the north, is the capital.

**YOUNG, JAMES**, an eminent practical chemist, was born at Glasgow on July 14, 1811. He studied chemistry under the celebrated Thomas Graham in Anderson's College, Glasgow, and became his assistant both there and afterwards at University College, London. Receiving appointments in chemical-works at St. Helens and Manchester, he discovered a method of distilling oil from bituminous shale, and thus became the founder of the mineral-oil industry of Scotland, besides leading to the development of the petroleum industry in America and elsewhere. (See **PARAFFIN**.) He acquired a large fortune and endowed a chair of chemistry in Anderson's College. He died May 13, 1883.

**YOUNG MEN'S CHRISTIAN ASSOCIATIONS**. Among the first of these was that founded in London in 1844 by Sir George Williams. Its object was the holding of religious meetings in business houses in the centre of London. The movement extended, and became one not only for the religious but also for the general culture and social well-being of young men engaged in business. The

young men's Christian associations, all of which are self-governing while forming an organized union, are now over 7500 in number, with a total membership of more than 600,000, the centres being scattered over the world. In the United Kingdom there are over 120,000 members, in the United States far more. The head-quarters of the English union are at Exeter Hall, London, which was bought for this purpose in 1880.

**YOUNGSTOWN**, a city of the United States, capital of Mahoning county, Ohio, on the Mahoning river, 67 miles south-east of Cleveland, in the vicinity of iron ore and coal-beds. The chief buildings are the county court-house, the city hospital, the public library, various churches, &c. It has rolling-mills, blast-furnaces, and manufactures of machinery, &c. Pop. (1890), 33,220; (1900), 44,885.

**YOUNG WOMEN'S CHRISTIAN ASSOCIATIONS**, on the same basis as the Young Men's, were founded in 1857 by the Dowager-Lady Kinraid, and now exist in various cities of Britain and America. Institutes and homes are established in connection with the various centres, including seaside homes at holiday resorts, in which young women may find lodging at easy rates. The head-quarters are in London. The total membership is about half a million.

**YSTAD**, a town of Sweden, in the län of Malmöhus, on the south coast, 36 miles E.S.E. of Malmö, with which it is connected by railway. It is irregularly built, but has a fine market-place. The town-hall is the principal building. It carries on a considerable trade, and its manufacturing and fishing industries are important. Pop. in 1900, 9862.

**YSTRADYFODWG**. See **RHONDDA** in **SUPP.**

## Z.

**ZAGRAB**. See **AGRAM**.

**ZEILAH**, a seaport of East Africa, on the British Somali coast and Gulf of Aden, about 100 miles south of the Strait of Bab-el-Mandeb, in the territory since 1884 belonging to Britain. It is important as the terminus of caravan routes from Harar and Shoa. Pop. 6000.

**ZENANA** (from the Persian *zan*, a woman), the name given to the portion of a house reserved exclusively for the females belonging to a family of good caste in India. In Bengal the privacy of the zenana is guarded with peculiar strictness, the females being kept in absolute seclusion from all men except their husbands and fathers. The zenana is built at the back part of the house and has no windows except what look into an inner court. As it is the custom in Bengal for sons when they marry still to live in the house of their father, the women residing in the zenana, though belonging to one family, are the wives of different husbands, but they must not be seen by any but their own. The women are kept in complete ignorance of everything, except how to braid their hair and cook for their husbands, this and the care of their children being their only employment. In recent years Christian ladies have been allowed to enter the zenana and impart some slight instruction to the hapless inmates.

**ZENJUN**, town of Persia, in the province of Irak-Ajemi, 170 miles W.N.W. of Teheran, with manufactures of carpets, woollen cloths, and arms. Pop. 15,000.

**ZERBST**, a town in the German duchy of An-

halt, on the Nuthe, 21 miles south-east of Magdeburg, with several interesting old buildings and some manufactures. Its numerous breweries are of considerable importance. Zerbst was founded in 1007. From 1603 till 1793 it was the capital of a principality of the same name, which in 1797 was absorbed in Anhalt-Dessau. Pop. (1900), 17,094.

**ZEULENRODA**, a town of Central Germany, in the principality of Reuss-Greiz, in a mountainous, forest-clad region, 23 miles W.S.W. of Zwickau. It has manufactures of hosiery, soap, metal wares, &c., and a trade in linen and cattle. Pop. (1895), 8942.

**ZOLA, ÉMILE**, French novelist, son of an Italian engineer and a Frenchwoman, was born in Paris on April 2, 1840. His father died in 1847, leaving his family in narrow circumstances. The future novelist was educated at the college of Aix, from which he went to the Lycée St. Louis at Paris with a scholarship in 1858. His career there was undistinguished, and he left in 1860 after failing to take his degree owing to insufficiency in literature. After a very brief experience as a clerk in a business house he was for more than a year compelled to sound the lowest depths of poverty in Paris, but in 1861 he obtained employment as a shopman with MM. Hachette, the publishers, at a salary of a pound a week. He devoted his spare time to literary work, contributing short stories to the *Petit Journal* and *La Vie Parisienne*, and critical articles to the *Salut Public* of Lyons and afterwards to *Villemeussant's* journals, the *Événement* and the *Figaro*. Several of his stories were published separately in the

volumes *Contes à Ninon* (1864), which contains some of his best and purest work, and which was followed in 1874 by *Nouveaux Contes à Ninon*. Some of his critical articles were collected under the title *Mes Haines* (1866). In *La Confession de Claude* (1865), a novel in which he utilized his early struggles, we find him already in full progress towards the characteristic work of his maturity, and this tendency became still more marked in the immediately succeeding novels: *Le Vœu d'une Morte* (1866); *Les Mystères de Marseille* (1867); *Thérèse Raquin* (1867), a powerful study of the effects of remorse following on adultery and murder; and *Madeleine Féral* (1868). Having by this time gained a secure footing in the world of letters, he conceived the plan of the series of novels known as *Les Rougon-Macquart*, which includes his best-known work and occupied him for nearly a quarter of a century. It is described as an 'histoire naturelle et sociale d'une famille sous le second empire', and consists of twenty works dealing with different phases of modern life, not always strictly that of the Second Empire, but rather that of the Third Republic. The particular departments of life treated in the volumes were studied by Zola in the spirit of a scientific observer, but of one with a decided bias towards the portrayal of moral filth and disease; and the bond of connection which constitutes them a series is the persistence under various forms in all the members of the Rougon family of a moral taint which is transmitted in accordance with Zola's views of heredity. The series consists of the following works: *La Fortune des Rougon* (1871); *La Curée* (1874); *La Conquête de Plassans* (1874); *Le Ventre de Paris* (1875), treating of the Paris markets; *La Faute de l'Abbé Mouret* (1875), whose subject is clerical celibacy; *Son Excellence Eugène Rougon* (1876); *L'Assommoir* (1877), a powerful but revolting study of the effects of drunkenness and idleness, the first great success of the series; *Nana* (1880), a coarse picture of courtesan life; *Pot-Bouille* (1882); *Au Bonheur des Dames* (1883), dealing with the great shops of Paris; *La Joie de Vivre* (1883); *Germinal* (1885), treating of the life of French miners; *L'Euvre* (1886), in which he dissects literary and artistic decadents; *La Terre* (1888), a study of the French peasantry in which prurient naturalism reaches the zenith of repulsiveness; *Le Rêve* (1888); *La Bête Humaine* (1890), treating of railways; *L'Argent* (1891), dealing with stockbrokers and company promoters; *La Débâcle* (1892), a powerfully realistic picture of military life in connection with the Franco-German war and the break-up of the Second Empire; and *Le Docteur Pascal* (1893), in which the whole is brought to a conclusion. Immediately after completing this huge undertaking he started the *Trois Villes* series, consisting of *Lourdes* (1894), *Rome* (1896), and *Paris* (1897), in which he portrays the spiritual development of a priest, Pierre Froment, out of miraculous Christianity through a sort of social Catholicism into a creed of justice and labour. In the incomplete tetralogy entitled *Les Quatres Évangiles* (The Four Gospels) he proposed to formulate his social

gospel. The first volume is *Fécondité* (1900), whose hero, Mathieu, is the son of the hero of the preceding series. The second volume, *Travail* (Labour—1901), has a hero named Luc; and of the remaining two, *Vérité* (Truth) and *Justice*, whose heroes were to be named after the other two evangelists, the former was appearing at the time of his death. In the eyes of English readers Zola appears best in his short stories, of which, in addition to those already mentioned, collections entitled *Le Capitaine Burle* (1882) and *Nais Micoulin* (1883) have been published. His famous story of *L'Attaque du Moulin* forms part of the volume of *Soirées de Médan* (1880), to which Maupassant and other friends also contributed. He defended his view of the nature and function of literary art and collected many critical articles in several works. Several of his novels were dramatized by himself and others, and he also wrote for the stage *Les Héritiers Rabourdin* (1874) and *Le Bouton de Rose* (1878), but none of them except *L'Assommoir* (1881), known in Charles Reade's English version as *Drink* (1879), were at all successful. Zola's chivalrous defence of Captain Dreyfus in 1898 led to his trial and condemnation to imprisonment and fine (see DREYFUS in SUPP.). He was created a knight of the Legion of Honour in 1888 and an officer in 1893, but after his condemnation in 1898 his name was removed from the roll. He was president of the *Société des Gens de Lettres* in 1891-94, but he was repeatedly refused admission to the Academy. He was accidentally poisoned on the morning of Sept. 29, 1902, by carbonic oxide gas proceeding from a defective stove in his house in Paris, and his wife was also in danger for a time.

Zola was the recognized head of the naturalistic school in fiction, but his followers were latterly few in number. His novels belong rather to the domain of science than to that of art. They are studies, in the main faithful enough though not free from distortion and exaggeration, in moral and social pathology; but they are not true to life and nature in the fullest sense, in the only sense which would entitle them to rank as artistic creations. A British publisher was prosecuted for publishing an unexpurgated translation of *La Terre*, but 'toned-down' translations of the most important have appeared, chiefly by Mr. Vizetelly. See R. H. Sherard's highly eulogistic biographical and critical study (1893).

**ZOMBA**, capital of the British Central Africa Protectorate, situated on the southern slope of Mt. Zomba, 10 miles west of Lake Shirwa, at the height of about 3000 feet above the sea. A sanatorium has been built on a plateau 2500 feet higher up. The population is as yet small.

**ZUMBO**, a town of South Africa, near the confluence of the Loangwa with the Zambesi, 450 miles from the mouth of the Zambesi. It marks the western point of the Portuguese territories on the Zambesi, and was formerly the seat of an important trade, but its trade has declined greatly and the town itself has decayed. The active development of this region will probably restore its importance.

# New Popular Encyclopedia

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